SOIL SURVEY

Alsea Area Oregon

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
and Forest Service
UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management
In cooperation with
OREGON BOARD OF NATURAL RESOURCES
and
OREGON AGRICULTURAL EXPERIMENT STATION
Issued October 1973

Major fieldwork for this soil survey was done in the period 1958–61. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1961. This survey was made cooperatively by the Soil Conservation Service, Forest Service, the Bureau of Land Management, the Oregon Board of Natural Resources, and the Oregon Agricultural Experiment Station. It is part of the technical assistance furnished to the Lincoln, Benton, Lane-Siuslaw, Linn-Lane, Mid-Lane, Upper Willamette, and North Lane Soil and Water Conservation Districts.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and forest; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of the Alsea Area are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each kind of soil is described, and the page for the forest management group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the section that discusses management by capability units.

Foresters and others can refer to the subsection "Forest Management Groups," where the soils of the county are grouped according to their suitability for trees.

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation, Morphology, and Classification of the Soils."

Newcomers in the Alsea Area will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the survey area given in the section "General Nature of the Area."

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Contents

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SOIL SURVEY OF ALSEA AREA, OREGON

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND FOREST SERVICE, AND UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, IN COOPERATION WITH THE OREGON BOARD OF NATURAL RESOURCES AND THE OREGON AGRICULTURAL EXPERIMENT STATION

THE ALSEA AREA is the geographic area that is drained by the Alsea River and its tributaries on the west slope of the Oregon Coast Range in the extreme west-central part of Oregon (fig. 1). It is bordered on the west

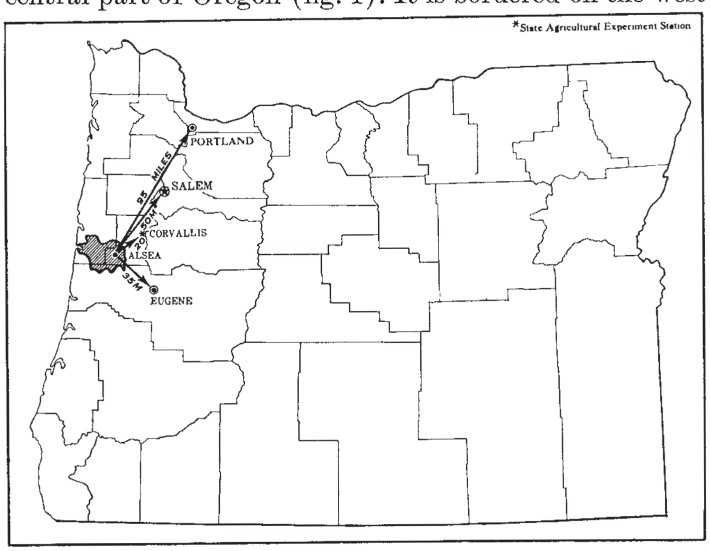

Figure 1.—**Location of the Alsea Area in Oregon.**

by the Pacific Ocean. The eastern boundary is about 13 miles southwest of Corvallis and about 18 miles northwest of Eugene. The watershed occupies about 283,455 acres, or about 442 square miles, and consists of parts of three counties. About 13 percent of the Alsea Area is in northwestern Lane County, about 37 percent is in western Benton County, and about 50 percent is in southern Lincoln County.

The soils in the Alsea Area are mainly steep and very steep and are on forested hills and mountains.

Most of the Area is managed primarily for wood crops. Wildlife, recreation, and watershed needs also are given major consideration in the overall management of the Alsea Area, especially in those areas managed by the U.S. Forest Service and the U.S. Bureau of Land Management.

Farming is limited to the bottom lands and low terraces along the major streams. Small grains, berries, nuts, and bulbs are grown, but in most places these nearly level to moderately sloping soils are used for pasture.

The Forest Service manages about 35 percent of the Area, and the Bureau of Land Management, about 25 percent. The remaining 40 percent is in private ownership.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Alsea Area, where they are located, and how they can be used. The soil scientists went into the area knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* (*18*) [3] are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Alsea and Blachly for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface

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[2] ROGER B. PARSONS assisted in revising format of the manuscript and in writing the section "Classification of the Soils."

[3] Italic numbers in parentheses refer to Literature Cited, page 80.

soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Blachly clay loam, dissected uneven, 25 to 37 percent slopes, is one of many phases within the Blachly series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. One such kind of mapping unit shown on the soil map of the Alsea Area is the soil complex.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Digger-Apt complex, 25 to 37 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Dune land is a land type in the Alsea Area.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on the response of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of forest, and engineers.

On the basis of practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the Alsea Area. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The five soil associations in the Alsea Area are discussed in the following pages. The terms for texture used in the title for an association apply to the subsoil of the major soils.

1. Bohannon-Slickrock association

Gravelly loam soils 20 to 40 inches deep over arkosic sandstone; and gravelly clay loam soils more than 48 inches deep to tuffaceous sandstone

This association consists of very steep soils in areas having many drainages that alternate with moderately steep soils in areas having only a few drainages. These soils formed mostly in material weathered from sandstone. Slopes range from 0 to 100 percent. Elevations range from about 100 to 4,000 feet. The average annual precipitation is 80 to 120 inches. The vegetation is mostly Douglas-fir, but western hemlock, bigleaf maple, and red alder are common. There is a dense understory of shrubs and herbs. The most common plant communities are vine maple—swordfern, salmonberry—swordfern, and salal—swordfern. This association occupies about 71 percent of the survey area.

Bohannon soils make up about 65 percent of the association, and Slickrock soils about 15 percent. The remaining 20 percent consists of minor soils, mainly of the Preacher, Blachly, Trask, and Astoria series.

Most of the Bohannon soils have slopes that exceed 35 percent, but slopes range from 5 to 100 percent. These soils are well drained. Their surface layer and subsoil are gravelly loam. Most of the Slickrock soils have slopes that are less than 35 percent, but slopes range to as much as 50 percent. These soils are well drained. Their surface layer is gravelly loam, and their subsoil is gravelly clay loam.

The soils of this association have a moderate to good potential for timber production. Slickrock soils generally are the most productive soils in the Alsea Area. Water supply is very high but is most prolonged from Slickrock and Blachly soils. Recreation use is mainly hunting or fishing. Interest in wildlife centers around

big-game animals and fish. Big-game animals congregate in areas that have been clear harvested because palatable brush is available there. Fishing pressure is heaviest in fall and winter for salmon and steelhead trout, which enter the streams from the Pacific Ocean to spawn.

Hard rock suitable for base stabilization and surfacing of roads is scarce. Roads are costly to build and have poor alinement in areas of Bohannon soils. The need for stabilizing the road base is high on Slickrock soils, as these soils are subject to slumping.

2. *Honeygrove-Digger-Hatchery association*

Clay soils more than 60 inches deep to bedrock; gravelly loam soils 20 to 40 inches deep over sandstone; and gravelly loam soils 20 to 40 inches deep over fractured basalt

This association consists dominantly of sloping to moderately steep soils that alternate with very steep to steep soils in areas having many drainages. Most of these soils formed in material weathered from sandstone. Slopes range from 0 to 75 percent. Elevations range from 200 to 1,800 feet. The relief is more subdued than in the Bohannon-Slickrock association. Ridges are low and broad in most places. The average annual precipitation is 60 to 80 inches. The vegetation mainly is Douglas-fir, but there are minor amounts of bigleaf maple, western hemlock, grand fir, alder, and Oregon white oak. In most places there is a dense understory of shrubs and herbaceous plants. The most common plant communities are ocean spray—salal, vine maple—swordfern, swordfern, and vine maple—salal. The brackenfern—salal plant community is common in the clear-harvested areas. This association occupies about 12 percent of the survey area.

Honeygrove soils make up about 30 percent of the association, Digger soils about 30 percent, and Hatchery soils 15 percent. The remaining 25 percent consists of minor soils, chiefly of the Apt and Bohannon series.

Most of the Honeygrove soils have slopes of 0 to 37 percent, but Honeygrove soils have slopes that range to 50 percent. These soils are well drained and are deep or very deep mostly to sandstone. The surface layer and subsoil are clay. Most of the Digger soils have slopes of 37 to 75 percent, but slopes range to as low as 5 percent. These soils are well drained and are 20 to 40 inches deep over sandstone. The surface layer and subsoil are gravelly loam. Most of the Hatchery soils have slopes of 37 to 85 percent, but in some areas slopes are as low as 25 percent. These soils are well drained and are 20 to 40 inches deep over fractured, hard basalt. Their surface layer and subsoil are gravelly loam.

The soils of this association have a moderate potential for timber production, but regeneration may be difficult on south-facing slopes and on the Digger soils. Regeneration is more difficult on soils of this association than on comparable soils in the Bohannon-Slickrock association. Water yield is moderate but is most prolonged from Honeygrove and Apt soils. The chief recreation uses are big-game hunting and fishing. Big-game animals congregate in clearings to feed on palatable brush and herbaceous plants that spring up after timber harvest. Except for the Hatchery soils, this association has a somewhat lower capacity for producing palatable brush species than the Bohannon-Slickrock association. Fishing pressure is heaviest in fall and winter for salmon and steelhead trout, which enter the streams from the Pacific Ocean to spawn.

Hard rock suitable for base stabilization and surfacing of roads is scarce in most of the association, except in areas of Hatchery soils and of Honeygrove soils that have a basalt substratum, which are located northeast and southeast of Alsea and Alsea Highway. Many quarries are on these soils, and these are the source of rock for much of the road construction in the Alsea Area. Roads are costly to build and have poorest alinement on Digger and Hatchery soils. The need for stabilizing the road base is higher on Honeygrove soils.

3. *Klickitat association*

Very gravelly clay loam soils 40 to 50 inches deep over basalt

This association consists dominantly of long, very steep and steep slopes that are dissected in many places by incised drainages. Slopes range from 10 to 85 percent. Most of these soils formed in material weathered from basalt, but others formed in material weathered from gabbro, diorite, or nepheline syenite. Elevations range from 250 to 4,100 feet. The average annual precipitation is 80 to 120 inches. The vegetation is mainly Douglas-fir, but the stands include minor amounts of western hemlock, bigleaf maple, and red alder. Mixed stands of Douglas-fir and western hemlock occur in coastal areas. There is a dense understory of shrubs and herbs. The most common plant communities in the understory are the swordfern, vine maple—swordfern, the salal, vine maple—salal, and the ocean spray—salal. This association occupies about 10 percent of the survey area.

Klickitat soils make up about 65 percent of the association. The remaining 35 percent consists of minor soils, mainly of the Marty, Mulkey, Slickrock, Blachly, Kilchis, and Bohannon series.

Klickitat soils are well drained. Their surface layer is gravelly clay loam, and their subsoil is very gravelly clay loam.

Soils of this association generally have a moderate to good potential for timber production and water supply. Water yield is high to very high but is not prolonged during summer. Recreational uses are chiefly game-bird hunting, big-game hunting, and fishing. This association supports a large population of birds and big-game animals that feed on the abundant and palatable plants and berries, especially in the logged areas. Fishing pressure is heaviest in the fall and winter for salmon and steelhead trout, which enter the streams from the ocean to spawn.

The supply of rock suitable for surfacing of roads generally is abundant in this association. On many of the Klickitat soils, roads are costly to build and have poor alinement.

4. *Skinner-Astoria-Fendall association*

Cobbly clay loam soils 40 to 60 inches deep over basalt; clay soils 50 to 72 inches deep over siltstone; and clay soils 20 to 40 inches deep over shale

The soils in this association are mainly moderately steep, but range from nearly level to very steep. These soils are near the coast, partly on marine terraces. They

formed in material weathered from basalt and sedimentary rocks, mainly siltstone and shale. Slopes range from 0 to 75 percent. Elevations range from near sea level to about 2,500 feet. The average annual precipitation is 60 to 100 inches. The vegetation is mixed conifers and hardwoods, including Douglas-fir, western hemlock, and alder. Some Sitka spruce and shore pine grow here also. The understory is dense and consists of salmonberry—swordfern or salal—swordfern plant communities. This soil association occupies about 3 percent of the survey area.

Skinner soils make up about 30 percent of this association, Astoria soils about 20 percent, and Fendall soils about 15 percent. The remaining 35 percent consists of minor soils, chiefly of the Lint, Depoe, Ferrelo, Desolation, and Hembre series.

Skinner soils are well drained. They have a surface layer of gravelly clay loam and a subsoil of cobbly clay loam. Astoria soils are well drained. They have a surface layer of clay loam and a subsoil of clay. Fendall soils are well drained. They have a surface layer of gravelly clay loam and a subsoil of clay.

Soils of this association have moderate to good potential for timber production of adapted species. Water yield is moderate to high, and the flow of water is very prolonged, especially from the deeper Skinner and Astoria soils. This association supports a large population of big-game animals, which frequent the logged over areas and graze the abundant quantity of palatable herbs and brush. The soils are suited to such recreational uses as deer hunting, fishing, and, on some soils near the ocean beach, camping and picnicking.

Roads on Skinner soils are expensive to build and may have poor alinement. On Astoria and Fendall soils, the cost of maintaining roads is high because of slumps and the continual removal of siltstone and shale fragments from the road surface and ditch. In some of the soils, permeability is moderately slow or slower, and therefore special care is needed in designing drainage, sanitary facilities, and water supplies at building sites and campgrounds.

5. *Knappa-Nehalem association*

Silty clay loam and silt loam soils more than 60 inches deep

The soils in this association are nearly level to moderately steep. They occur chiefly along the major drainageways, but small areas extend far up the minor tributaries. Most of these soils formed in alluvium. Some areas are flooded frequently, but others are on terraces many feet above historic high water marks. Slopes range from 0 to 13 percent. Elevations range from near sea level to about 600 feet. The average annual precipitation is 60 to 100 inches. Originally, the vegetation consisted of native conifers and mixed hardwoods, but now most areas are in pasture or brush. Other areas are forested with bigleaf maple, red alder, and Douglas-fir. The understory consists of many kinds of shrubs and herbs, including salmonberry, vine maple, swordfern, brackenfern, and western dewberry. This association occupies about 4 percent of the survey area.

Knappa soils make up 35 percent of the association, and Nehalem soils 25 percent. The remaining 40 percent consists of minor soils, mainly of the Alsea, Brenner, Chitwood, Clatsop, Hebo, and Nestucca series.

Knappa soils are well drained. They have a surface layer of silt loam or silty clay loam and a subsoil of silty clay loam. Nehalem soils also are well drained and are silt loam throughout most of the profile. The minor soils are moderately well drained to very poorly drained.

Soils of this association have a moderate to good potential for pasture. Some areas are suited to cultivated crops, such as beans, berries, grains, and nuts. Most of the acreage supported coniferous forest before the survey area was settled, and most areas are suited to the production of timber. In managing the major soils, the principal concerns are soil erosion and obtaining sufficient irrigation water for intensive use. Finding suitable outlets for disposing of excess water from the more poorly drained areas is difficult. Soils in this association border the streams and are used for access by fishermen, boaters, and swimmers. Campgrounds have been developed in a few places.

Coarse fragments suitable for base stabilization and surfacing of roads are scarce in most areas. Roads are costly to build but have good alinement. The need for stabilizing the road base is high, and extensive drainage is needed in some areas.

Descriptions of the Soils

This section describes the soil series and mapping units in the Alsea Area. The approximate acreage and proportionate extent of each mapping unit are given in table 1.

In the pages that follow, a general description of each soil series is given. Each series description has a detailed description of a profile typical of the series and a brief statement of the range in characteristics of the soils in the series, as mapped in this area. Following the series description, each mapping unit in the series is described individually. For full information on any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit. Miscellaneous land types, such as Loamy alluvial land, are described in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. At the end of the description of each mapping unit are listed the capability unit and the forest management group in which the mapping unit has been placed. The page on which each of these groups is described can be found readily by referring to the "Guide to Mapping Units" at the back of this survey.

Unless otherwise indicated, field determination of pH was made using an approximate color indicator at a 1:5 dilution. See "Reaction, soil" in the Glossary for pH ranges.

For more general information about the soils, the reader can refer to the section "General Soil Map," in which the broad patterns of soils are described. Many of the terms used in the soil descriptions and other parts of the survey are defined in the Glossary.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Alsea loam, 0 to 3 percent slopes	930	0. 3
Alsea loam, 3 to 8 percent slopes	390	. 1
Apt clay, 5 to 25 percent slopes	989	. 4
Apt clay, 25 to 37 percent slopes	1, 457	. 5
Apt clay, 37 to 50 percent slopes	305	. 1
Apt clay, dissected, 25 to 45 percent slopes	734	. 3
Astoria clay loam, dissected, 5 to 25 percent slopes	237	. 1
Astoria clay loam, dissected, 25 to 37 percent slopes	417	. 1
Astoria clay loam, dissected, 37 to 50 percent slopes	265	. 1
Astoria clay loam, dissected uneven, 25 to 37 percent slopes	1, 185	. 4
Astoria clay loam, dissected uneven, 37 to 50 percent slopes	771	. 3
Astoria clay loam, ridge, 0 to 25 percent slopes	559	. 2
Astoria clay loam, uneven, 10 to 25 percent slopes	242	. 1
Astoria clay loam, uneven, 25 to 37 percent slopes	235	. 1
Blachly clay loam, 0 to 25 percent slopes	1, 141	. 4
Blachly clay loam, 25 to 37 percent slopes	1, 154	. 4
Blachly clay loam, 37 to 50 percent slopes	374	. 1
Blachly clay loam, dissected, 25 to 40 percent slopes	444	. 2
Blachly clay loam, dissected uneven, 25 to 37 percent slopes	499	. 2
Blachly clay loam, dissected uneven, 37 to 50 percent slopes	273	. 1
Blachly clay loam, ridge, 0 to 25 percent slopes	1, 669	. 6
Blachly clay loam, uneven, 10 to 25 percent slopes	695	. 2
Blachly clay loam, uneven, 25 to 37 percent slopes	1, 660	. 6
Blachly clay loam, uneven, 37 to 50 percent slopes	338	. 1
Blachly clay loam, basalt substratum, uneven, 25 to 37 percent slopes	993	4
Blachly clay loam, basalt substratum, dissected, 25 to 37 percent slopes	250	. 1
Blachly clay loam, basalt substratum, ridge, 5 to 25 percent slopes	897	. 3
Blachly clay loam, basalt substratum, ridge, 25 to 37 percent slopes	299	. 1
Bohannon loam, ridge, 5 to 25 percent slopes	2, 370	. 8
Bohannon gravelly loam, 5 to 35 percent slopes	1, 630	. 6
Bohannon gravelly loam, 35 to 50 percent slopes	7, 548	2. 7
Bohannon gravelly loam, 50 to 75 percent slopes	8, 787	3. 1
Bohannon gravelly loam, dissected, 25 to 37 percent slopes	884	. 3
Bohannon gravelly loam, dissected, 37 to 50 percent slopes	17, 012	6. 0
Bohannon gravelly loam, dissected, 50 to 90 percent slopes	51, 270	18. 1
Bohannon gravelly loam, ridge, 25 to 37 percent slopes	3, 031	1. 1
Bohannon gravelly loam, ridge, 37 to 50 percent slopes	1, 091	. 4
Bohannon rocky loam, 75 to 100 percent slopes	888	. 3
Bohannon gravelly loam, syenite substratum, 5 to 50 percent slopes	256	. 1
Bohannon gravelly loam, syenite substratum, dissected, 50 to 75 percent slopes	276	. 1
Bohannon-Slickrock gravelly loams, 25 to 35 percent slopes	4, 127	1. 5
Bohannon-Slickrock gravelly loams, 35 to 50 percent slopes	8, 587	3. 0
Bohannon-Slickrock gravelly loams, 50 to 75 percent slopes	789	. 3
Bohannon-Slickrock gravelly loams, dissected, 25 to 37 percent slopes	3, 126	1. 1
Bohannon-Slickrock gravelly loams, dissected, 37 to 50 percent slopes	22, 566	8. 0
Bohannon-Slickrock gravelly loams, dissected, 50 to 75 percent slopes	2, 470	. 9
Brenner silt loam	410	. 1
Chitwood silt loam, 0 to 3 percent slopes	285	. 1
Chitwood silt loam, 3 to 13 percent slopes	370	. 1
Clatsop silty clay loam	725	. 3
Colluvial and Alluvial land	3, 735	1. 3
Depoe silt loam	181	. 1
Desolation clay loam, 10 to 35 percent slopes	767	. 3
Digger gravelly loam, 20 to 37 percent slopes	350	. 1
Digger gravelly loam, 37 to 50 percent slopes	707	. 1
Digger gravelly loam, 50 to 75 percent slopes	742	. 3
Digger gravelly loam, dissected, 37 to 50 percent slopes	1, 304	. 5
Digger gravelly loam, dissected, 50 to 75 percent slopes	3, 214	1. 1
Digger gravelly loam, ridge, 5 to 37 percent slopes	317	. 1
Digger-Apt complex, 25 to 37 percent slopes	564	. 2
Digger-Apt complex, 37 to 60 percent slopes	857	. 3
Digger-Apt complex, dissected, 25 to 37 percent slopes	1, 065	. 4
Digger-Apt complex, dissected, 37 to 60 percent slopes	2, 390	. 8
Dune land	142	. 1
Fendall gravelly clay loam, 25 to 37 percent slopes	407	. 1
Fendall gravelly clay loam, 37 to 50 percent slopes	754	. 3
Fendall gravelly clay loam, 50 to 75 percent slopes	207	. 1
Ferrelo loam, 5 to 30 percent slopes	425	. 1
Hatchery gravelly loam, 25 to 37 percent slopes	602	. 2
Hatchery gravelly loam, 37 to 50 percent slopes	491	. 2
Hatchery gravelly loam, 50 to 85 percent slopes	717	. 3
Hatchery gravelly loam, dissected, 37 to 50 percent slopes	822	. 3
Hatchery gravelly loam, dissected, 50 to 85 percent slopes	1, 127	. 4
Hatchery-Honeygrove complex, 25 to 37 percent slopes	393	. 1
Hatchery-Honeygrove complex, 37 to 50 percent slopes	458	. 2
Hatchery-Honeygrove complex, dissected, 25 to 37 percent slopes	531	. 2
Hatchery-Honeygrove complex, dissected, 37 to 50 percent slopes	659	. 2
Hebo silty clay loam	260	. 1
Hembre clay loam, 5 to 25 percent slopes	567	. 2
Honeygrove clay, 0 to 25 percent slopes	1, 101	. 4
Honeygrove clay, 25 to 37 percent slopes	421	. 1
Honeygrove clay, 37 to 50 percent slopes	332	. 1
Honeygrove clay, dissected, 25 to 50 percent slopes	294	. 1
Honeygrove clay, dissected uneven, 25 to 37 percent slopes	649	. 2
Honeygrove clay, dissected uneven, 37 to 50 percent slopes	1, 310	. 5
Honeygrove clay, ridge, 5 to 25 percent slopes	1, 409	. 5
Honeygrove clay, ridge, 25 to 37 percent slopes	242	. 1

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Area	Extent
	Acres	*Percent*
Honeygrove clay, uneven, 5 to 25 percent slopes	491	.2
Honeygrove clay, uneven, 25 to 37 percent slopes	1,795	.6
Honeygrove clay, uneven, 37 to 50 percent slopes	668	.2
Honeygrove clay, basalt substratum, 0 to 25 percent slopes	392	.1
Honeygrove clay, basalt substratum, 25 to 37 percent slopes	388	.1
Honeygrove clay, basalt substratum, ridge, 0 to 25 percent slopes	684	.2
Honeygrove clay, basalt substratum, uneven, 10 to 37 percent slopes	453	.2
Honeygrove clay, heavy variant, 0 to 25 percent slopes	196	.1
Honeygrove clay, heavy variant, uneven, 25 to 40 percent slopes	642	.2
Kilchis rocky loam, 50 to 100 percent slopes	1,568	.5
Klickitat loam, 10 to 35 percent slopes	453	.2
Klickitat gravelly clay loam, 25 to 37 percent slopes	1,331	.5
Klickitat gravelly clay loam, 37 to 50 percent slopes	2,867	1.0
Klickitat gravelly clay loam, 50 to 75 percent slopes	2,290	.8
Klickitat gravelly clay loam, dissected, 25 to 37 percent slopes	668	.2
Klickitat gravelly clay loam, dissected, 37 to 50 percent slopes	4,014	1.4
Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes	6,300	2 2
Klickitat gravelly clay loam, ridge, 25 to 45 percent slopes	687	.2
Klickitat-Blachly complex, 25 to 50 percent slopes	2,331	8
Knappa silt loam, 0 to 3 percent slopes	1,618	.6
Knappa silt loam, 3 to 8 percent slopes	1,515	5
Knappa silty clay loam, 8 to 13 percent slopes	1,034	.4
Landslides-Apt material	258	.1
Landslides-Slickrock material	730	.3
Lint silty clay loam, 3 to 25 percent slopes	441	.2
Lint silty clay loam, 25 to 37 percent slopes	387	.1
Loamy alluvial land	265	.1
Marty silty clay loam, 0 to 25 percent slopes	552	.2
Marty silty clay loam, 25 to 40 percent slopes	365	.1
Marty silty clay loam, ridge, 10 to 30 percent slopes	587	.2
Mulkey loam, 5 to 25 percent slopes	229	.1
Mulkey loam, 25 to 50 percent slopes	678	.2
Nehalem silt loam	2,757	1.0
Nestucca silt loam, 0 to 3 percent slopes	1,031	.4
Nestucca silt loam, 3 to 8 percent slopes	245	.1
Preacher clay loam, 0 to 25 percent slopes	1,065	.4
Preacher clay loam, 25 to 37 percent slopes	757	.3
Preacher clay loam, dissected, 25 to 45 percent slopes	395	.1
Preacher clay loam, ridge, 0 to 25 percent slopes	5,514	1.9
Preacher clay loam, ridge, 25 to 37 percent slopes	1,371	.5
Sandy alluvial land	582	.2
Skinner gravelly clay loam, 5 to 37 percent slopes	430	.1
Skinner gravelly clay loam, 37 to 50 percent slopes	198	1
Skinner gravelly clay loam, 50 to 75 percent slopes	206	.1
Skinner gravelly clay loam, dissected, 25 to 50 percent slopes	797	3
Skinner-Desolation complex, 10 to 37 percent slopes	405	1
Skinner-Desolation complex, dissected, 25 to 50 percent slopes	576	2
Slickrock loam, 10 to 25 percent slopes	1,965	.7
Slickrock loam, dissected, 10 to 25 percent slopes	467	.2
Slickrock gravelly loam, 0 to 25 percent slopes	679	.2
Slickrock gravelly loam, 25 to 37 percent slopes	17,324	6.1
Slickrock gravelly loam, 37 to 50 percent slopes	3,989	1.4
Slickrock gravelly loam, dissected, 25 to 37 percent slopes	7,866	2 8
Slickrock gravelly loam, dissected, 37 to 50 percent slopes	4,587	1.6
Slickrock gravelly loam, seeped, 10 to 35 percent slopes	389	.1
Tidal marsh	347	.1
Trask gravelly loam, 50 to 100 percent slopes	1,873	.7
Miscellaneous land (towns, quarries, etc.)	203	.1
Water	2,157	.8
Total	283,455	100.0

Alsea Series

The Alsea series consists of moderately well drained, nearly level to gently sloping soils that developed in alluvium on terraces. These soils formed under Douglas-fir, hemlock, western redcedar (also called cedar in this soil survey), bigleaf maple, and alder having an understory mostly of the vine maple—swordfern plant community. Elevations range from 20 to 300 feet. The average annual precipitation is 65 to 90 inches. The average annual air temperature is about 52° F., and the average frost-free period is about 200 days. Alsea soils are associated with Knappa and Chitwood soils.

In a representative profile, the surface layer is about 14 inches thick and consists of very dark brown loam that contains a few dark-brown and dark yellowish-brown mottles. The subsoil, about 41 inches thick, is very dark brown, dark-brown, and dark yellowish-brown loam that has a few strong-brown, olive-brown, and yellowish-brown mottles. The underlying layer has the same colors as the subsoil but is heavy silt loam in texture.

Alsea loam, 0 to 3 percent slopes (AaA).—This nearly level soil occupies terraces.

Representative profile on the east side of the Honeygrove Creek county road, about 575 feet south of the bridge over the North Fork of the Alsea River; NW¼ NW¼, lot 43, T. 14 S., R. 7 W. (or in what would be the NW¼NW¼NW¼ sec. 5, T. 14 S., R. 7 W., if the west line of sec. 5 were extended to meet the north line):

Ap—0 to 6 inches, very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) when dry; moderate and weak, very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; many irregular pores; very strongly acid; abrupt, smooth boundary. (5 to 8 inches thick)

A1—6 to 11 inches, very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) when dry; few variegations of very dark grayish brown (10YR 3/2) that appear to be worm casts; few, fine, distinct, dark-brown (7.5YR 4/4) mottles; moderate, very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; many irregular pores; medium acid; gradual, smooth boundary. (4 to 6 inches thick)

A3—11 to 14 inches, very dark brown (10YR 2/3) loam, dark brown (10YR 4/3) when dry; thin coatings of very dark brown (10YR 2/2) on ped surfaces, few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; moderate, very fine, subangular blocky structure, slightly hard, friable, slightly sticky, slightly plastic, common very fine roots; common very fine tubular and irregular pores; medium acid; gradual, smooth boundary. (3 to 5 inches thick)

B1—14 to 19 inches, very dark brown (10YR 2/3) loam, very dark yellowish brown (10YR 3/4) when dry; some lighter and darker colored coatings; few, very fine, distinct, yellowish-brown (10YR 5/8) mottles; moderate, very fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots, few very fine tubular pores; strongly acid; gradual, smooth boundary. (4 to 7 inches thick)

B21—19 to 29 inches, very dark brown (10YR 2/3) loam, dark yellowish brown (10YR 4/4) when dry; moderate, very fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine tubular pores; medium acid, gradual, smooth boundary. (7 to 12 inches thick)

B22—29 to 35 inches, dark-brown (7.5YR 3/4) loam, dark yellowish brown (10YR 4/4) when dry; thin coatings of very dark brown (7.5YR 2/2); moderate to weak, fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine and fine tubular pores; medium acid; gradual, smooth boundary (5 to 8 inches thick)

B23—35 to 45 inches, dark yellowish-brown (10YR 3/4) loam, dark yellowish brown (10YR 4/4) when dry; thin coatings of dark grayish brown (2 5Y 4/2); few, fine, distinct, strong-brown (7 5YR 5/6) mottles; weak, fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular pores; medium acid; gradual, smooth boundary. (7 to 12 inches thick)

B3—45 to 55 inches, about equally mixed colors of dark-brown and dark yellowish-brown (10YR 4/3 and 4/4) loam, yellowish brown (10YR 5/4) when dry; streaks of strong-brown (7.5YR 5/6) and common, fine, distinct, olive-brown (2 5Y 4/4 mottles; few thin coatings of dark grayish brown (10YR 4/2); weak, medium, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular pores; very strongly acid; gradual, smooth boundary. (8 to 12 inches thick)

C—55 to 60 inches, similar to B3 horizon but is heavy silt loam and is massive.

In places sand and gravel lenses occur in the lower part of the B horizon and in the C horizon. The B2 horizon ranges from loam to clay loam.

This soil has moderate permeability. Runoff is slow, and the hazard of erosion is slight. The available water holding capacity is 9 to 11 inches. Effective rooting depth is 60 inches or more. In winter and early in spring, however, a water table may occur at depths between 35 and 60 inches.

This Alsea soil is well suited to and is used for pasture, berries, grain, and row crops. Unless drainage is improved, early grazing or cultivation is not desirable. If the soil is protected from excessive compaction and erosion, it is suitable for development of campgrounds. Big-game animals browse the available palatable brush and herbs. Capability unit IIw–1, not placed in a forest management group.

Alsea loam, 3 to 8 percent slopes (AaB).—This soil is similar to Alsea loam, 0 to 3 percent slopes, but it is gently sloping or undulating. The surface layer is about 12 inches thick in most places. Included in mapping were areas of Knappa soils. This soil is warmer and drier in spring than Alsea loam, 0 to 3 percent slopes. For this reason, it generally is possible to graze and cultivate this soil earlier in spring. The hazard of erosion is moderate. Capability unit IIIw–1, not placed in a forest management group.

Apt Series

The Apt series consists of well-drained, gently sloping to steep soils that developed in colluvium derived from arkosic sandstone (fig. 2). The tree canopy is mainly

Figure 2.—**An area of Apt clay; this soil is muddy and easily compacted when wet.**

Douglas-fir, but hemlock and deciduous species generally are present. The understory commonly is a vine maple—swordfern or a vine maple—salal plant community. Elevations range from 500 to 1,500 feet. The average annual precipitation is 60 to 80 inches. The average annual air temperature is 51 to 53° F. and the frost-free period is 190 to 210 days. Apt soils are associated with Honeygrove, Bohannon, Digger, and Trask soils.

In a representative profile, the surface mineral layer is about 8 inches thick and consists of very dark brown and dark-brown clay. This layer is covered with a 2-inch organic layer of partly decomposed deciduous tree and shrub leaves and fern fronds. The upper part of the subsoil is about 41 inches thick and is dark yellowish-brown, dark-brown, and brown clay and gravelly silty clay. The lower part of the subsoil is yellowish-brown very gravelly silty clay loam that extends to a depth of 63 inches or more. A few outcrops of rock are in some places.

Apt clay, 5 to 25 percent slopes (AcD).—This soil is gently sloping to sloping and occurs in the mountains.

Representative profile about 30 feet north of the logging road where the road makes a sharp switchback to the east in S½NW¼SW¼NE¼ sec. 19, T. 14 S., R. 7 W., about 3 miles south of Alsea in Benton County:

O1—2 inches to 0, partially decomposed leaves from deciduous trees and vine maple and fronds from fern.

A11—0 to 2 inches, very dark brown (10YR 2/2) clay, grayish brown (10YR 5/2) when dry; strong, fine, granular structure; hard, friable, slightly sticky, slightly plastic; many roots, many fine irregular pores; 5 percent pebbles; strongly acid; abrupt, smooth boundary. (2 to 4 inches thick)

A12—2 to 8 inches, dark-brown (10YR 3/3) clay, grayish brown (10YR 5/2) when dry; strong, very fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many roots; common fine irregular pores; thin, patchy, darker colored coatings; 3 percent pebbles; strongly acid; clear, smooth boundary. (5 to 8 inches thick)

B1t—8 to 19 inches, dark yellowish-brown (10YR 3/4) clay, brown (10YR 5/3) when dry; moderate, very fine, subangular blocky structure; hard, friable, sticky, slightly plastic; common roots; common very fine tubular pores; few thin clay films; 5 percent pebbles; very strongly acid; clear, smooth boundary. (10 to 12 inches thick)

B21t—19 to 24 inches, dark-brown (10YR 4/3) clay, yellowish brown (10YR 5/4) when dry; moderate, very fine, subangular blocky structure; hard, firm, sticky, plastic; common roots; common very fine tubular pores; few thin and moderately thick clay films; 15 percent pebbles; very strongly acid; clear, smooth boundary. (4 to 7 inches thick)

B22t—24 to 37 inches, dark-brown (7.5YR 4/4) gravelly silty clay, brown (7 5YR 5/4) when dry; moderate, very fine, subangular blocky structure; hard, firm, sticky, plastic; few roots; few very fine tubular pores; common, thin, reddish-brown clay films; 20 percent light-colored sandstone pebbles and cobblestones; very strongly acid; gradual, smooth boundary. (10 to 15 inches thick)

B23t—37 to 49 inches, brown (7.5YR 4/4) gravelly silty clay, strong brown (7.5YR 5/6) when dry; moderate, very fine, subangular blocky structure; hard, firm, sticky, plastic; few roots; few very fine tubular pores; common moderately thick clay films; 30 percent sandstone pebbles and cobblestones; very strongly acid; clear, smooth boundary. (10 to 15 inches thick)

B3—49 to 63 inches, yellowish-brown (10YR 5/4) very gravelly silty clay loam, very pale brown (10YR 7/4) when dry; moderate, very fine, subangular blocky structure; hard, slightly firm, sticky, slightly plastic; few roots; few very fine tubular pores; few thin clay films; 50 percent pebbles and cobblestones; strongly acid.

Content of gravel and cobblestones in the B horizon ranges from 5 to 45 percent.

Included with this soil in mapping were a few areas of Honeygrove soils.

Permeability is moderately slow. Runoff is medium. The available water holding capacity is 7 to 9 inches. Effective rooting depth is 60 inches or more. The hazard of erosion is moderate.

This Apt soil is used mainly for timber production and water supply. It is also used for such recreation purposes as camping and hunting or fishing. To control erosion, campgrounds should be protected from compaction or water accumulation. Big-game animals browse the palatable herbs and brush in areas that have been cleared. Capability unit IVe–1, forest management group 2.

Apt clay, 25 to 37 percent slopes (AcE).—This soil is similar to Apt clay, 5 to 25 percent slopes, but is moderately steep to steep. Included in mapping were areas of Digger soils along the drainageways. Runoff is rapid on this soil and the hazard of erosion is high.

This soil is not suitable for campgrounds, because of slope. Capability unit VIe–1, forest management group 2.

Apt clay, 37 to 50 percent slopes (AcF).—This soil is similar to Apt clay, 5 to 25 percent slopes, but it is steep. Included in mapping were a few areas of Honeygrove soils. Runoff is rapid, and the hazard of erosion is high.

This soil is not suitable for campgrounds, because of slope and the hazard of wind-thrown trees. Capability unit VIe–5, forest management group 4.

Apt clay, dissected, 25 to 45 percent slopes (AdF).—This soil is similar to Apt clay, 5 to 25 percent slopes, but it has moderately steep or steep, dissected slopes. Gravel makes up 35 percent of the subsoil in some places. Included in mapping were a few areas of Honeygrove soils. Runoff is rapid, and the hazard of erosion is high.

This soil is not suitable for campgrounds, because of slope. Capability unit VIe–1, forest management group 4.

Astoria Series

The Astoria series consists of well-drained, nearly level to steep soils that developed in alluvium and colluvium or in residuum derived from tuffaceous siltstone. The tree canopy in most areas is Douglas-fir having an understory of a salal, ocean spray—salal, vine maple—salal, or brackenfern—salal plant community. In the coastal area, the tree canopy is mainly western hemlock and Sitka spruce but some Douglas-fir is also present. In this area a plant community of salal—swordfern or salmonberry—swordfern is characteristic in the understory. Elevations range from 1,000 to 2,500 feet. The average annual precipitation is about 80 inches and the average annual temperature is about 49° F. Astoria soils are associated with Hembre, Kilchis, and Trask soils.

In a representative profile, the surface layer is dark-brown clay loam about 14 inches thick. The subsoil is dark-brown clay and dark yellowish-brown very gravelly clay loam about 36 inches thick. Sedimentary bedrock is at a depth of about 50 inches.

Astoria clay loam, dissected, 5 to 25 percent slopes (ArD).—This gently sloping to sloping soil is in the mountains. The tree canopy is dominantly western hemlock and Sitka spruce, and the understory is a salal—swordfern or a salmonberry—swordfern plant community.

Representative profile along an abandoned tractor road, about 150 feet west of timber boundary and about 100 feet north of small landing on small spur ridge, in the northeast corner of SE¼NE¼SE¼ sec. 10, T. 13 S., R. 8 W., about 6 miles north-northwest of Alsea in Benton County:

A1—0 to 5 inches, dark-brown (7.5YR 3/2) clay loam, dark-brown (7.5YR 4/4) when dry; moderate, fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many very fine irregular pores; very strongly acid; clear, smooth boundary. (4 to 7 inches thick)

A3—5 to 14 inches, dark-brown (7 5YR 3/3) clay loam, dark brown (7.5YR 4/4) when dry; moderate, fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; thin slightly darker colored coatings on peds; many roots; common very fine irregular pores, 10 percent pebbles; very strongly acid; clear, smooth boundary. (0 to 11 inches thick)

B21—14 to 23 inches, dark-brown (7.5YR 3/4) clay, dark brown (7.5YR 4/4) when dry; moderate, very fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; thin, patchy, darker-colored ped coatings; common roots; common very fine irregular pores and few fine tubular pores; 5 percent pebbles; very strongly acid: gradual, smooth boundary (7 to 10 inches thick)

B22—23 to 36 inches, dark-brown (7.5YR 3/4) clay, dark brown (7.5YR 4/4) when dry; moderate, very fine, subangular blocky structure; hard, friable, sticky, slightly plastic; very few, thin, darker-colored coatings on peds; few roots; common very fine tubular pores; 5 percent pebbles; extremely acid; gradual, smooth boundary. (10 to 15 inches thick)

IIB3—36 to 50 inches, dark yellowish-brown (10YR 4/4) very gravelly heavy clay loam, yellowish brown (10YR 5/4) when dry; weak, very fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; thin patchy coatings on peds; 50 percent somewhat weathered pebbles; few roots; common very fine tubular pores; extremely acid; clear, wavy boundary. (12 to 24 inches thick)

IIR—50 inches, fractured siltstone; a few crevices filled with soil material from above.

The A horizon is about 15 percent pebbles in some places. Basalt pebbles are in a few profiles Depth to bedrock ranges from 50 to 72 inches

Included in mapping were a few areas of Hembre soils. A somewhat poorly drained soil occurs in a few depressions and flat areas.

Permeability is moderate, runoff is medium, and the hazard of erosion is slight. The available water holding capacity is 6 to 10 inches. Effective rooting depth is 50 to 72 inches.

This Astoria soil is used mainly for timber production and water supply. It is also used for wildlife habitat. Big-game animals frequently graze the abundant supply of palatable brush and herbs. The principal recreation use is hunting, especially in the areas that have been clear harvested. The soil is not suitable for campgrounds, because of slope and the roughness of the terrain. Capability unit VIe-3, forest management group 3.

Astoria clay loam, dissected, 25 to 37 percent slopes (ArE).—This soil is similar to Astoria clay loam, dissected, 5 to 25 percent slopes, but it is moderately steep to steep. Runoff is rapid on this soil, and the hazard of erosion is moderate. The tree canopy is mainly Douglas-fir, and the understory is a brackenfern—salal plant community. Capability unit VIe-3, forest management group 3.

Astoria clay loam, dissected, 37 to 50 percent slopes (ArF).—This soil is similar to Astoria clay loam, dissected, 5 to 25 percent slopes, but it has steep slopes. This soil is about 4 feet deep. Runoff is rapid, and the hazard of erosion is high. The tree canopy is dominantly Douglas-fir that has an understory consisting mainly of a salal plant community. Capability unit VIe-3, forest management group 3.

Astoria clay loam, dissected uneven, 25 to 37 percent slopes (AsE).—This soil is similar to Astoria clay loam, dissected, 5 to 25 percent slopes, but it has moderately steep to steep, uneven slopes. The subsoil is slightly mottled and in places is 10 percent pebbles. Bedrock generally occurs at a depth of about 6 feet but may be deeper under slumps. Runoff is rapid, and the hazard of erosion is moderate. The most unstable areas of this soil are near incised drainages.

Generally, the tree canopy is dominantly Douglas-fir having an understory of a salal, an ocean spray—salal, or a vine maple—salal plant community. In small coastal areas, however, the canopy is mainly western hemlock and Sitka spruce and the understory is a salal—swordfern or a salmonberry—swordfern plant community. Capability unit VIe-3, forest management group 4.

Astoria clay loam, dissected uneven, 37 to 50 percent slopes (AsF).—This soil is similar to Astoria clay loam, dissected, 5 to 25 percent slopes, but it has steep, uneven slopes. Pebbles make up 5 to 10 percent of the surface layer and 20 to 30 percent of the subsoil. Bedrock generally is at a depth of about 5 feet but it is deeper under slumps. Runoff is rapid on this soil, and the hazard of erosion is high.

In most places the tree canopy is dominantly Douglas-fir having an understory of a salal, an ocean spray—salal, or a vine maple—salal plant community. In small coastal areas, however, the canopy is mainly western hemlock and Sitka spruce. Here, the understory is a salal—swordfern or a salmonberry—swordfern plant community. Capability unit VIe-3, forest management group 4.

Astoria clay loam, ridge, 0 to 25 percent slopes (AtD).—This soil is similar to Astoria clay loam, dissected, 5 to 25 percent slopes, but it is level to sloping and occupies long, narrow ridgetops. Pebbles make up 10 to 20 percent of the surface layer and about 5 percent of the subsoil. Depth to bedrock is about 4 feet. Runoff is medium, and the hazard of erosion is slight.

The dominant tree canopy is western hemlock and Sitka spruce. A plant community of salal—swordfern or salmonberry—swordfern is characteristic in the understory. In small inland areas, however, the tree canopy is mainly Douglas-fir and a salal plant community is in the understory.

After adequate drainfields have been provided for sewage disposal systems and the surface is protected from compaction and erosion, this soil is suitable for small campgrounds. Capability unit VIe-3, forest management group 6.

Astoria clay loam, uneven, 10 to 25 percent slopes (AuD).—This soil is similar to Astoria clay loam, dissected, 5 to 25 percent slopes, but it has uneven slopes. The subsoil is 10 to 20 percent pebbles and may be mottled. Bedrock is at a depth of 7 to 9 feet. Runoff is medium on this soil, and the hazard of erosion is slight. The tree canopy is dominantly western hemlock and Sitka spruce, and the understory is a salal—swordfern or a salmonberry—swordfern plant community.

This soil is suitable for use as campgrounds if compaction is minimized. Capability unit VIe-3, forest management group 6.

Astoria clay loam, uneven, 25 to 37 percent slopes (AuE).—This soil is similar to Astoria clay loam, dissected, 5 to 25 percent slopes, but it has moderately steep to steep, uneven slopes. The subsoil is 20 to 30 percent pebbles and may be mottled. Depth to bedrock generally is about 7 feet. Runoff is rapid, and the hazard of erosion is moderate. The tree canopy is dominantly western hemlock and Sitka spruce having an understory of a salal—swordfern or a salmonberry—swordfern plant community. Capability unit VIe-3, forest management group 6.

Blachly Series

The Blachly series consists of well-drained, nearly level to steep soils that developed in alluvial and colluvial materials derived from arkosic sandstone. The native vegetation is dominantly Douglas-fir and hemlock, but a

few cedars are also present. Vine maple—swordfern, salal—swordfern, or ocean spray—salal plant communities are common in the understory. Elevations range from 250 to 3,000 feet. The average annual precipitation is 80 to 120 inches. The average annual temperature is 50° F., and frost-free season ranges from 160 to 200 days. Blachly soils are associated with Hembre, Marty, Klickitat, Preacher, Slickrock, and Bohannon soils.

In a representative profile, the surface mineral layer is about 9 inches thick and consists of dark-brown clay loam. This is covered with a layer of decomposed and fresh plant materials consisting of conifer needles and deciduous plant leaves. The subsoil is about 85 inches thick and consists of dark-red and dark reddish-brown clay. Strongly weathered and fractured rock is at a depth of about 94 inches.

Blachly clay loam, uneven, 25 to 37 percent slopes (BeE).—This moderately steep to steep soil has uneven slopes and is in the mountains.

Representative profile about 9 miles south-southwest of Alsea and on the west side of a logging spur road (at the back of the slump near the rise in slope) in the N½SW¼SE¼NW¼ sec. 22, T. 15 S., R. 8 W., Lane County:

O1—1 inch to 0, fermentation layer of needles, small branches, cones, and deciduous leaves.

A1—0 to 9 inches, dark-brown (7.5YR 3/2) clay loam, brown (7.5YR 4/3) when dry; strong, fine and medium, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; common fine irregular pores; 5 percent coarse fragments; 10 percent charcoal; medium acid; clear, wavy boundary. (8 to 12 inches thick)

B11—9 to 20 inches, yellowish-red (5YR 3/6) clay, yellowish red (5YR 4/6) when dry; moderate, medium, fine and very fine, subangular blocky structure; hard, friable, sticky, slightly plastic; common roots; many very fine tubular pores; common, thin, darker colored ped coatings; few clear mineral grains on ped surfaces; few charcoal fragments; medium acid; clear, wavy boundary. (6 to 12 inches thick)

B12—20 to 31 inches, dark-red (2.5YR 3/6) clay, yellowish red (5YR 4/6) when dry; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; few roots; common very fine tubular pores; few clear mineral grains on ped surfaces; few charcoal fragments; medium acid; gradual, smooth boundary. (5 to 12 inches thick)

B21—31 to 44 inches, dark-red (2.5YR 3/6) clay, yellowish red (5YR 4/6) when dry; moderate, fine, subangular blocky structure; hard, friable, sticky, plastic; common very fine tubular pores; very few roots; few clean mineral grains on ped surfaces, few charcoal fragments; medium acid; gradual, smooth boundary. (9 to 15 inches thick)

B22—44 to 53 inches, dark-red (2.5YR 3/6) clay, yellowish red (5YR 4/6) when dry; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; very few roots; common very fine tubular pores; few clean mineral grains on ped surfaces; a few slickensides; medium acid; gradual, smooth boundary. (6 to 12 inches thick)

B23—53 to 78 inches, dark reddish-brown (2.5YR 3/4) clay, yellowish red (5YR 4/6) when dry; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; very few roots; common very fine tubular pores; few clean mineral grains on ped surfaces; medium acid; gradual, smooth boundary. (17 to 33 inches thick)

B3—78 to 94 inches, reddish-brown (5YR 4/4) clay, reddish brown (5YR 5/4) when dry; has dark-brown (7.5YR 4/4) streaks; moderate and weak, fine, subangular blocky structure; hard, friable, sticky, plastic; very few roots; common very fine tubular pores; few clean mineral grains on ped surfaces; medium acid; gradual, smooth boundary. (10 to 24 inches thick)

C—94 inches, strongly weathered sandstone with thick, continuous, red coatings along fractures.

Depth to bedrock is 5 to 12 feet. Pebbles and cobblestones of weathered sandstone make up about 20 percent of the B horizon in some places.

Included with this soil in mapping were some areas of Preacher and Slickrock soils. A few depressions have a high water table in winter and spring.

Permeability is moderately slow in this soil. Runoff is rapid, and the available water holding capacity is 7 to 9 inches. Effective rooting depth is 90 inches or more. The hazard of erosion is moderate.

This soil is used mainly for timber production and water supply. It also is used as habitat for big game. These animals freely browse the palatable herbs and brush in areas that were previously clear harvested. Hunting is the main recreation use. This soil is not suitable for campgrounds, because of slope and the hazard of severe compaction. Capability unit VIe–1, forest management group 2.

Blachly clay loam, basalt substratum, uneven, 25 to 37 percent slopes (BfE).—This soil appears in the table on engineering test data (see table 2, p. 48).

Representative profile along skid road just south of the center of NW¼NE¼ sec. 18, T. 13 S., R. 7 W.; to reach site, take Clemons Road in the SE¼ sec. 10, T. 13 S., R. 7 W., continue about 5 miles west to Starkers Saddle No. 2, then take road to the right for about 0.8 mile, then take skid road to the right for about 750 feet; site is west of the young Douglas-fir trees about 150 feet on the right, about 4½ miles north of Alsea:

O1—2 inches to 0, mostly litter from brackenfern and salal.

A1—0 to 5 inches, dark reddish-brown (5YR 3/3) clay loam, reddish brown (5YR 4/4) when dry; strong, very fine, granular structure; hard, friable, slightly sticky, plastic; many roots; many interstitial pores; few pebbles (5 percent); common charcoal fragments; common hard shot; strongly acid; clear, smooth boundary. (5 to 8 inches thick)

A3—5 to 9 inches, dark reddish-brown (5YR 3/4) clay, reddish brown (5YR 4/4) when dry; strong, very fine, granular structure; slightly hard, friable, slightly sticky, plastic; common roots; many fine interstitial pores; very few pebbles (2 percent); few hard shot; strongly acid; clear, smooth boundary. (4 to 8 inches thick)

B1—9 to 16 inches, dark reddish-brown (2.5YR 3/4) clay, yellowish red (5YR 4/6) when dry; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; many roots; many very fine tubular pores; thin patchy coatings on ped faces; very few stones (1 percent), few very hard shot; strongly acid; clear, smooth boundary. (6 to 10 inches thick)

B21—16 to 24 inches, dark reddish-brown (2.5YR 3/4) clay, yellowish red (5YR 5/6) when dry; moderate, fine and very fine, subangular blocky structure; hard, firm, sticky, plastic; common roots; few fine tubular pores; thin nearly continuous coatings on ped faces with a "pebble grain" appearance; very few stones (1 percent); few very hard shot; strongly acid; gradual, smooth boundary. (5 to 10 inches thick)

B22—24 to 36 inches, red (2.5YR 4/6) clay, yellowish red (5YR 5/6) when dry; moderate and weak, fine and medium, subangular blocky structure; hard, firm, sticky, plastic; common roots; few fine tubular pores; thin continuous coatings on ped faces; very few stones (1 percent); very few very hard shot; few, soft, very fine, black concretions; strongly acid; gradual, smooth boundary (10 to 15 inches thick)

B31—36 to 46 inches, red (2.5YR 4/6) clay, yellowish red (5YR 5/6) when dry; weak, fine, subangular blocky structure; hard, firm, sticky, plastic; few roots; few fine tubular pores; thin continuous coatings on ped faces; very few stones (1 percent); few very hard shot; common, soft, very fine, black concretions and stains; strongly acid; gradual, smooth boundary. (15 to 25 inches thick)

B32—46 to 58 inches, red (2.5YR 4/6) clay, yellowish red (5YR 5/6) when dry; common, yellowish-red and reddish-yellow (5YR 4/8 and 7.5YR 7/8, moist) rock ghosts; weak, fine, subangular blocky structure, hard, friable, sticky, slightly plastic; few roots; few fine tubular pores; thin continuous coatings on ped faces; few stones (5 percent); few very hard shot; very few, very fine, soft, black concretions and stains; strongly acid; gradual, smooth boundary. (10 to 15 inches thick)

B33—58 to 68 inches, red (2.5YR 4/6) clay, yellowish red (5YR 5/6) when dry; weak, fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; very few roots; few fine tubular pores; thin continuous coatings on ped faces; common rock ghosts; few stones (1 percent); few, very soft, black concretions and stains; few very hard shot; strongly acid; gradual, smooth boundary. (8 to 12 inches thick)

C—68 to 90 inches, yellowish-red (5YR 4/6) clay, yellowish red (5YR 5/6) when dry; weak, fine, subangular blocky structure; hard, friable, sticky, slightly plastic; sparse roots; few very fine tubular pores; thin patchy coatings on ped faces; many (30 percent) boulders with concentric weathering shells; few very hard shot; common, very fine, soft, black concretions and stains; strongly acid.

Pebbles make up 10 to 15 percent of the surface layer, and cobblestones make up 20 to 30 percent of the subsoil.

Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–1, forest management group 1.

Blachly clay loam, 0 to 25 percent slopes (BaD).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it is nearly level to sloping and has smooth slopes. Runoff is medium on this soil, and the hazard of erosion is moderate.

This soil is only fairly suitable for campgrounds because of moderately slow permeability, the risk of soil compaction, the erosion hazard, and medium windthrow hazard. Capability unit VIe–1, forest management group 1.

Blachly clay loam, 25 to 37 percent slopes (BaE).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it has smooth slopes. Included in mapping were some areas of Preacher soils. This Blachly soil is about 5 feet deep. Strongly weathered pebbles make up as much as 25 percent of the subsoil. Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–1, forest management group 1.

Blachly clay loam, 37 to 50 percent slopes (BaF).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it has steep, smooth slopes. Included in mapping were many small areas of Preacher and Bohannon soils. The depth to bedrock is about 5 feet. Strongly weathered pebbles and cobblestones make up as much as 30 percent of the subsoil. Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–5, forest management group 1.

Blachly clay loam, dissected, 25 to 40 percent slopes (BbE).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it has dissected, smooth slopes. Included in mapping were areas of Preacher and Bohannon soils. This Blachly soil is about 5 feet deep. Strongly weathered pebbles and cobblestones make up 25 percent of the subsoil. Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–1, forest management group 3.

Blachly clay loam, dissected uneven, 25 to 37 percent slopes (BcE).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it has dissected slopes. Included in mapping were a few areas of Bohannon soils along incised drainages and areas of undulating Slickrock soils. Runoff is rapid on this soil, and the hazard of erosion is moderate. Capability unit VIe–1, forest management group 4.

Blachly clay loam, dissected uneven, 37 to 50 percent slopes (BcF).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it has steep, dissected slopes. Included in mapping were areas of Slickrock soils between the drainages and Bohannon soils adjacent to the drainages. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 4.

Blachly clay loam, ridge, 0 to 25 percent slopes (BdD).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it is level to sloping and occupies long, narrow ridgetops. This soil is about 5 feet deep, and in most places strongly weathered pebbles and cobblestones make up 25 to 30 percent of the subsoil. The surface layer is clay in a few places. Included in mapping were areas of Preacher and Slickrock soils. Runoff is medium, and the hazard of erosion is moderate.

This soil is only fairly suitable for use as campgrounds because of moderately slow permeability, risk of soil compaction, the erosion hazard, and a medium windthrow hazard. Capability unit VIe–1, forest management group 1.

Blachly clay loam, uneven, 10 to 25 percent slopes (BeD).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it has sloping, uneven slopes and wet areas are in depressions. Included in mapping were a few small areas of Slickrock soils. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIe–1, forest management group 2.

Blachly clay loam, uneven, 37 to 50 percent slopes (BeF).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it has steep slopes. The soil generally is 6 to 8 feet deep. Strongly weathered pebbles and cobblestones make up 20 to 30 percent of the subsoil. Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–5, forest management group 4.

Blachly clay loam, basalt substratum, dissected, 25 to 37 percent slopes (BgE).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it has moderately steep to steep, dissected slopes and is underlain by fractured basalt bedrock at a depth of about 5 feet. Included in mapping were areas of Klickitat soils along the drainages. Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–1, forest management group 4.

Blachly clay loam, basalt substratum, ridge, 5 to 25 percent slopes (BhD).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it is gently sloping to sloping, occupies smooth, long, narrow ridges, and is underlain by basalt bedrock at a depth of about 7 feet. Included in mapping were some areas of Klickitat soils. Runoff is medium, and the hazard of erosion is

moderate. Capability unit VIe–1, forest management group 1.

Blachly clay loam, basalt substratum, ridge, 25 to 37 percent slopes (BhE).—This soil is similar to Blachly clay loam, uneven, 25 to 37 percent slopes, but it is moderately steep to steep, occupies long, narrow ridges, and is underlain by fractured basalt bedrock at a depth of about 5 feet. Pebbles and cobblestones make up 20 to 30 percent of the subsoil in some places. Included in mapping were some areas of Klickitat soils. Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–1, forest management group 1.

Bohannon Series

The Bohannon series consists of well-drained, gently sloping to extremely steep soils that developed in alluvial and colluvial materials derived from arkosic sandstone. The tree canopy is dominantly Douglas-fir. Vine maple—swordfern and vine maple—salal plant communities are common in the understory. Elevations range from 100 to 4,000 feet. The average annual precipitation is 60 to 120 inches. The average annual air temperature is 48 to 50° F., and the frost-free period is 160 to 180 days. Bohannon soils are associated with Apt, Blachly, Preacher, Honeygrove, Slickrock, Trask, Mulkey and Digger soils.

In a representative profile, the surface mineral layer is about 11 inches thick and consists of dark-brown gravelly loam. This is covered with an organic layer that consists of about one-half inch of freshly fallen needles and fern fronds. The subsoil is dark-brown gravelly loam about 13 inches thick. The underlying material is fractured sandstone.

Bohannon gravelly loam, dissected, 50 to 90 percent slopes (BmG).—This soil has very steep to extremely steep, dissected slopes and is in the mountains.

Representative profile, about 200 feet west of corner of logging spur road where this road leaves bench and crosses steep slope facing south in the west half of SW¼NW¼ sec. 22, T. 15 S., R. 8 W., about 9 miles south-southwest of Alsea in Lane County:

O1—½ inch to 0, intermittent horizon of freshly fallen needles and fern fronds.

A1—0 to 4 inches, dark-brown (10YR 3/3) gravelly loam, dark grayish brown (10YR 4/2) when dry; moderate, fine, granular structure; slightly hard, friable, nonsticky, nonplastic; common roots; many fine and very fine irregular pores; 20 percent pebbles; very strongly acid; abrupt, smooth boundary. (3 to 12 inches thick)

A3—4 to 11 inches, dark-brown (10YR 3/3) gravelly loam, brown (10YR 4/3) when dry; moderate, fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic: common roots; common fine and very fine irregular pores; 20 percent pebbles, cobblestones, and stones; strongly acid, clear, smooth boundary (0 to 8 inches thick)

B2—11 to 17 inches, dark-brown (7.5YR 3/4) gravelly loam, brown (10YR 5/3) when dry; weak to moderate, very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common roots; many fine pores; few, thin, darker-colored coatings in pores; 20 percent somewhat weathered pebbles, cobblestones, and stones; medium acid; clear, smooth boundary. (6 to 20 inches thick)

B3—17 to 24 inches, brown (7.5YR 4/4) gravelly loam, yellowish brown (10YR 5/4) when dry; weak, very fine, subangular blocky structure: slightly hard, friable, slightly sticky, slightly plastic; many fine pores; common roots; few, thin, darker-colored coatings in pores; 30 percent somewhat weathered pebbles, cobblestones, and stones; medium acid; clear, smooth boundary. (0 to 10 inches thick)

IIC1—24 to 58 inches, fractured arkosic sandstone with dark yellowish-brown gravelly loam in fractures; gravelly loam is similar to material in B3 horizon and accounts for about 10 percent of the IIC1 horizon; gradual, irregular boundary. (30 to 36 inches thick)

IIC2—58 to 120 inches, arkosic sandstone.

Depth to the fractured partially weathered bedrock ranges from 20 to 40 inches In the upper 20 to 30 inches of the profile, gravel and cobblestones make up less than 5 percent to 30 percent of the A horizon and 20 to 50 percent of the B horizon These coarse fragments are slightly weathered to moderately weathered

Included with this soil in mapping were areas of Trask and Slickrock soils and rock outcrops.

This soil has moderately rapid permeability. Runoff is very rapid, and the hazard of erosion is very high. The available water holding capacity is 3 to 4 inches. Effective rooting depth generally is 20 to 40 inches, but may be slightly deeper where bedrock is fractured.

This Bohannon soil is used for timber production and water supply. Big-game hunting is the main recreation use, but the soil is not suited to campground development, because of slope. Big-game animals browse the rather sparse cover of brush and herbaceous plants in the harvested areas. Capability unit VIIe–2, forest management group 10.

Bohannon loam, ridge, 5 to 25 percent slopes (BkD).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it is gently sloping to sloping and occupies long, undissected, narrow ridges. The surface layer is less than 20 percent pebbles. This soil is about 30 to 40 inches deep. The available water holding capacity is 4 to 6 inches. Included in mapping were some areas of a soil similar to Bohannon soil that is 40 to 50 inches deep, and some areas of Preacher and Blachly soils. Runoff is medium, and the hazard of erosion is moderate.

This soil is suitable for use as campgrounds but windthrow is a high hazard. Capability unit VIe–2; forest management group 7.

Bohannon gravelly loam, 5 to 35 percent slopes (BlE).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it has gently sloping to moderately steep, undissected slopes. The depth of this soil is about 30 to 40 inches. The available water holding capacity is 4 to 6 inches. Included in mapping were some areas of a soil similar to Bohannon soil that is about 40 to 50 inches deep, and some areas of Blachly and Preacher soils. Runoff is medium, and the hazard of erosion is moderate.

This soil is suitable for use as campgrounds, but windthrow is a high hazard. Capability unit VIe–2, forest management group 7.

Bohannon gravelly loam, 35 to 50 percent slopes (BlF).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it has steep, undissected slopes. Included in mapping were a few areas of Slickrock and Trask soils. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 8.

Bohannon gravelly loam, 50 to 75 percent slopes (BlG).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it has undissected

slopes. Included in mapping, near the base of long slopes, were areas of a soil that is 4 to 5 feet thick. Also included were areas of Trask soils or rock outcrops, mostly on the upper one-third of the slope. Runoff is very rapid, and the hazard of erosion is very high. Capability unit VIIe–2, forest management group 10.

Bohannon gravelly loam, dissected, 25 to 37 percent slopes (BmE).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it has moderately steep slopes. In most places the soil is 30 to 40 inches deep. The available water holding capacity is 4 to 6 inches. Included in mapping, adjacent to drainageways, were a few areas of a soil similar to Bohannon soil that is about 40 to 60 inches deep. Also included were areas of Slickrock and Preacher soils. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–2, forest management group 9.

Bohannon gravelly loam, dissected, 37 to 50 percent slopes (BmF).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it has steep slopes. Included in mapping were a few areas of Slick rock, Preacher, and Trask soils. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 9.

Bohannon gravelly loam, ridge, 25 to 37 percent slopes (BnE).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it is moderately steep and occupies undissected, long, narrow ridges. Included in mapping were small areas of Preacher soils. Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–2, forest management group 7.

Bohannon gravelly loam, ridge, 37 to 50 percent slopes (BnF).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it is steep and occupies long, undissected, narrow ridges. Included in mapping were small areas of Trask soils and rock outcrops. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 8.

Bohannon rocky loam, 75 to 100 percent slopes (BoG).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it has undissected slopes. Exposed bedrock makes up as much as 10 percent of the surface of areas mapped as this soil. Included in mapping were many areas of Trask soils and rock outcrops; these are mostly on the upper one-third of the slope. Runoff is very rapid, and the hazard of erosion is very high. Capability unit VIIs–1, forest management group 10.

Bohannon gravelly loam, syenite substratum, 5 to 50 percent slopes (BpF).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it has gently sloping to steep, undissected slopes and is underlain by nepheline syenite bedrock at a depth of about 40 inches. Pebbles and cobblestones make up about 20 percent of the subsoil. Included in mapping were areas of Preacher soils and a few small wet areas. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Capability unit VIe–2, forest management group 7.

Bohannon gravelly loam, syenite substratum, dissected, 50 to 75 percent slopes (BrG).—This soil is similar to Bohannon gravelly loam, dissected, 50 to 90 percent slopes, but it has steep, undissected slopes and is underlain by nepheline syenite bedrock. Bedrock containing a few fractures is at a depth of about 37 inches. The available water holding capacity of this soil is 4 to 6 inches. Included in mapping were areas of a soil that is similar to this one but has a subsoil that is as much as 60 percent pebbles and cobblestones. Also included were small areas of Kilchis soils. Runoff is very rapid, and the hazard of erosion is very high. Capability unit VIIe–2, forest management group 11.

Bohannon-Slickrock gravelly loams, 25 to 35 percent slopes (BsE).—This complex consists of small areas of Slickrock soils that are so closely intermingled with areas of Bohannon soils that mapping them separately is impractical. The complex is about 60 percent Bohannon gravelly loam, 5 to 35 percent slopes, and about 40 percent Slickrock gravelly loam, 0 to 25 percent slopes. Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–2, forest management group 7.

Bohannon-Slickrock gravelly loams, 35 to 50 percent slopes (BsF).—This complex consists of small areas of Slickrock soils that are so closely intermingled with areas of Bohannon soils that mapping them separately is impractical. The complex is about 65 percent Bohannon gravelly loam, 35 to 50 percent slopes, and about 35 percent Slickrock gravelly loam, 0 to 25 percent slopes. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 8.

Bohannon-Slickrock gravelly loams, 50 to 75 percent slopes (BsG).—This complex consists of small areas of Slickrock soils that are so closely intermingled with areas of Bohannon soils that mapping them separately is impractical. The complex is about 75 percent Bohannon gravelly loam, 50 to 75 percent slopes, and about 25 percent Slickrock gravelly loam, 0 to 25 percent slopes. Runoff is very rapid, and the hazard of erosion is very high. Capability unit VIIe–2, forest management group 10.

Bohannon-Slickrock gravelly loams, dissected, 25 to 37 percent slopes (BtE).—This complex consists of small areas of Slickrock soils that are so closely intermingled with areas of Bohannon soils that mapping them separately is impractical. The complex is about 60 percent Bohannon gravelly loam, dissected, 25 to 37 percent slopes, and about 40 percent Slickrock gravelly loam, 0 to 25 percent slopes. Runoff is rapid, and the hazard of erosion is moderate. Capability unit VIe–2, forest management group 9.

Bohannon-Slickrock gravelly loams, dissected, 37 to 50 percent slopes (BtF).—This complex consists of small areas of Slickrock soils that are so closely intermingled with areas of Bohannon soils that mapping them separately is impractical. The complex is about 65 percent Bohannon gravelly loam, dissected, 37 to 50 percent slopes, and about 35 percent Slickrock gravelly loam, 0 to 25 percent slopes. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 9.

Bohannon-Slickrock gravelly loams, dissected, 50 to 75 percent slopes (BtG).—This complex consists of small areas of Slickrock soils that are so closely intermingled with areas of Bohannon soils that mapping them separately is impractical. The complex is about 75 percent Bohannon gravelly loam, dissected, 50 to 90 percent slopes and about 25 percent Slickrock gravelly loam, 0 to

25 percent slopes. Runoff is very rapid, and the hazard of erosion is very high. Capability unit VIIe–2, forest management group 11.

Brenner Series

The Brenner series consists of nearly level, poorly drained soils that developed in swales on flood plains. These soils probably formed under grass and scattered hardwoods, but most areas have been cleared and drained. Elevations range from 10 to 300 feet. The average annual precipitation is 60 to 100 inches. The average annual air temperature is about 52° F., and the average frost-free period is about 180 days. Brenner soils are associated with Nehalem, Clatsop, Nestucca, and Knappa soils.

In a representative profile, the surface layer is about 17 inches thick and consists of very dark brown and very dark grayish brown silt loam and silty clay loam that contains common, fine, distinct, strong-brown mottles. The subsoil, about 15 inches thick, is very dark grayish-brown and very dark gray heavy silty clay loam containing common, distinct, yellowish-brown and dark-brown mottles. The underlying material is dark grayish-brown silty clay loam containing a few strong-brown mottles.

Soils of the Brenner series, as mapped in the Alsea Area, have a thicker and darker colored surface layer and subsoil than is within the range defined for the series. This does not significantly affect their use and management.

Brenner silt loam (Bu).—This nearly level soil occupies swales on flood plains.

Representative profile, 125 feet east of Lobster Valley highway in SW¼ sec. 15, T. 14 S., R. 8 W.:

Ap—0 to 7 inches, very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) when dry; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; moderate to strong, fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic, many roots; many very fine tubular pores; strongly acid; clear, smooth boundary. (5 to 10 inches thick)

A3—7 to 17 inches, very dark grayish-brown (10YR 3/2) light silty clay loam, dark brown (10YR 4/3) when dry; common, fine, distinct, strong-brown (7.5YR 5/6) mottles and very dark grayish-brown (2.5Y 3/2) coatings; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky, plastic; few roots; many very fine tubular pores; 3 percent pebbles; few, fine, black concretions; strongly acid; gradual, smooth boundary. (5 to 12 inches thick)

B1—17 to 22 inches, very dark grayish-brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) when dry; few, fine, distinct, strong-brown (7.5YR 5/6) mottles; few thin coatings of very dark grayish brown (2.5Y 3/2); moderate, very fine, subangular blocky structure; slightly hard, friable, slightly sticky, plastic; few roots; many very fine tubular pores; strongly acid; gradual, smooth boundary. (4 to 12 inches thick)

B2g—22 to 32 inches, very dark gray (10YR 3/1) heavy silty clay loam, grayish brown (10YR 5/2) when dry; common, fine, distinct, yellowish-brown (10YR 5/6) and dark-brown (10YR 4/3) mottles; moderate, very fine, subangular blocky structure; hard, friable, sticky, plastic; few roots; many very fine tubular pores; strongly acid; gradual, smooth boundary (8 to 14 inches thick)

Cg—32 to 48 inches, dark grayish-brown (2.5Y 4/2) and dark yellowish-brown (10YR 4/4) silty clay loam; few, fine, prominent, strong-brown (7.5YR 5/6) mottles; massive; slightly hard, friable, sticky, plastic; many fine tubular pores; strongly acid.

Sand and gravel lenses occur in the lower part of the B horizon and the C horizon in some places. The subsoil is silty clay in places. Soil depth is more than 5 feet.

Included with this soil in mapping were a few areas of Nestucca soils.

Permeability is slow in this soil. Runoff is very slow, and the hazard of erosion is only slight. The available water holding capacity is 7 to 12 inches. Unless this soil is drained, the effective rooting depth for most cultivated crops is limited by the seasonal water table, which is at a depth of less than 40 inches during most of the growing season. For water-tolerant grasses, the effective rooting depth is more than 60 inches. Although this soil is ponded every year, flooding by streams is not common.

This Brenner soil is used for pasture, hay, and silage in areas that have been cleared and drained. Some areas are still in alder and hemlock having a dense understory of shrubs and water-tolerant forbs. The soil also is used to a limited extent as big-game habitat. This soil is not suitable for campgrounds, because of slow permeability and a high water table. Capability unit IIIw–3, not placed in a forest management group.

Chitwood Series

The Chitwood series consists of moderately well drained and somewhat poorly drained, nearly level to sloping soils that formed in alluvium on fans and terraces. These soils probably formed under Douglas-fir, hemlock, and cedar, but in most areas they have been cleared and are used for pasture. Elevations range from 50 to 200 feet. The average annual precipitation is 80 to 100 inches. The average annual air temperature is about 52° F., and the average frost-free period is about 180 days. Chitwood soils are associated with the well-drained Knappa soils and the poorly drained Hebo soils.

In a representative profile, the surface layer is very dark brown silt loam about 6 inches thick. The subsoil is about 46 inches thick and is very dark brown, dark-brown, and grayish-brown silty clay loam and silty clay that has common, distinct, yellowish-brown and grayish-brown mottles. The underlying material is light brownish-gray and strong-brown silty clay loam.

Chitwood silt loam, 0 to 3 percent slopes (ChA).—This soil is nearly level and is on terraces.

Representative profile, 75 feet east of trees along west fence near northwest corner of a pasture in NW¼SE¼ sec. 8, T. 14 S., R. 8 W.:

Ap—0 to 6 inches, very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) when dry; few, fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; common roots; common very fine tubular and irregular pores; very strongly acid; gradual, smooth boundary. (5 to 8 inches thick)

B1—6 to 16 inches, very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) when dry; few, very fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; hard, firm, sticky, plastic; few roots; few very fine tubular pores; few thin clay films; few, thin, black coatings; very strongly acid; gradual, smooth boundary. (6 to 12 inches thick)

B2t—16 to 24 inches, dark-brown (10YR 3/3) silty clay, brown (10YR 4/3) when dry; common, fine, distinct, yellowish-brown (10YR 5/8) and grayish-brown (10YR 5/2) mottles; moderate to strong, fine and very fine, angular blocky structure; hard, firm, sticky, plastic; few roots; few very fine tubular pores; common thin clay films; few thin black coatings; very strongly acid; gradual, smooth boundary. (6 to 12 inches thick)

B3g—24 to 52 inches, grayish-brown (10YR 5/2) silty clay loam; light gray (10YR 7/2) when dry; common, medium, faint, dark-brown (10YR 4/3) mottles and few, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, angular blocky structure; hard, firm, slightly sticky, plastic; few roots; many very fine and fine tubular pores; very strongly acid; diffuse, smooth boundary. (20 to 30 inches thick)

Cg—52 to 60 inches, light brownish-gray (2.5Y 6/2) and strong-brown (7.5YR 5/8) silty clay loam; massive; hard, firm, sticky, plastic; few very fine tubular pores; few, thin, black coatings; very strongly acid.

Sand and gravel lenses, or cobblestones, are in the lower part of the B horizon and in the C horizon in some places. The texture of the B2t horizon ranges to clay. The soil is more than 5 feet deep.

Included with this soil in mapping were areas of Alsea and Hebo soils.

This soil is somewhat poorly drained. Permeability is slow. Runoff is slow, and the hazard of erosion is slight. The available water holding capacity is 11 to 12 inches. Effective rooting depth is 50 inches or more during most of the growing season. In winter and early in spring, however, a water table may be between depths of 6 and 24 inches.

This Chitwood soil is used mainly for pasture. It is also used to a limited extent as big-game habitat. It is not suitable for campgrounds, because of slow permeability and a high water table. Capability unit IIw-3, not placed in a forest management group.

Chitwood silt loam, 3 to 13 percent slopes (ChC).—This soil is similar to Chitwood silt loam, 0 to 3 percent slopes, but it is gently sloping to moderately sloping and occupies fans and terraces. In some places on fans, the soil is 10 percent pebbles, contains a few cobblestones, and has a very dark brown surface layer 20 inches thick. This soil is moderately well drained. Runoff is slow, and the hazard of erosion is slight to moderate. Capability unit IIIw-1, not placed in a forest management group.

Clatsop Series

The Clatsop series consists of very poorly drained soils that developed in alluvium deposited in the quiet water of Alsea Bay just above normal high tide. These soils formed under grasses, sedges, and rushes in nearly level areas. Elevations range from 1 to 5 feet. The average annual precipitation is 60 to 100 inches. The average annual air temperature is 51° F., and the average frost-free season is 202 days. Clatsop soils are associated with Nehalem, Nestucca, and Brenner soils.

In a representative profile, the surface mineral layer is about 6 inches thick and consists of very dark grayish-brown silty clay loam that contains common, distinct mottles. This surface layer is covered with a layer of peat about 6 inches thick. Underlying the surface layer is very dark gray silty clay that contains common, prominent mottles.

Clatsop silty clay loam (Cs).—This nearly level soil occupies flats just above average high tide. Slopes are less than 3 percent.

Representative profile, on west bank at the south end of a dug ditch in the SW¼NW¼NW¼ sec. 27, T. 13 S., R. 11 W., in Lincoln County:

O1—6 inches to 0, peat and some mineral soil; very strongly acid; abrupt, smooth boundary. (3 to 6 inches thick)

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) silty clay loam, light brownish gray (10YR 6/2) when dry; common, fine, distinct, strong-brown (7.5YR 5/6) and olive-gray (5Y 4/2) mottles; massive; hard, friable, slightly sticky, slightly plastic; many roots; many very fine tubular pores; common, very dark brown, fibrous material; strongly acid; abrupt, smooth boundary. (5 to 8 inches thick)

C1g—6 to 18 inches, very dark gray (5Y 3/1) silty clay; gray (5Y 5/1) when dry; common, fine, prominent, brown (7.5YR 4/4), and strong-brown (7.5YR 5/6) mottles; massive; hard, firm, sticky, plastic; common roots; few very fine pores; medium acid; clear, smooth boundary. (10 to 20 inches thick)

C2g—18 to 36 inches, very dark gray (5Y 3/1) heavy silty clay loam, light gray (5Y 6/1) when dry; common, fine, distinct, brown (7.5YR 4/2) mottles; massive; hard, firm, sticky, plastic; few roots; few fine and very fine pores; slightly acid

Sand and gravel lenses may be in the lower part of the profile. In some places the organic horizon above the A horizon consists of a thin layer of peat over muck. In places there are organic horizons less than 6 inches thick throughout the profile. Texture below a depth of 10 inches ranges from heavy silty clay loam to clay The entire profile ranges from very strongly acid to slightly acid.

Permeability is moderately slow. Runoff is very slow to ponded. Effective rooting depth is more than 60 inches for water- and salt-tolerant grasses but may be considerably less for other crops. This soil is subject to tidal overflow, especially during high tides in winter, and may be flooded with brackish water. During the summer, the soil is salty because of the evaporation of brackish water. The hazard of erosion is slight. The available water holding capacity is 10 to 12 inches.

Unless this soil is drained, it has few uses. In areas where drainage is improved and where the soil is protected by levees, it is used for pasture, forage, and vegetable crops (fig. 3). It provides limited habitat for

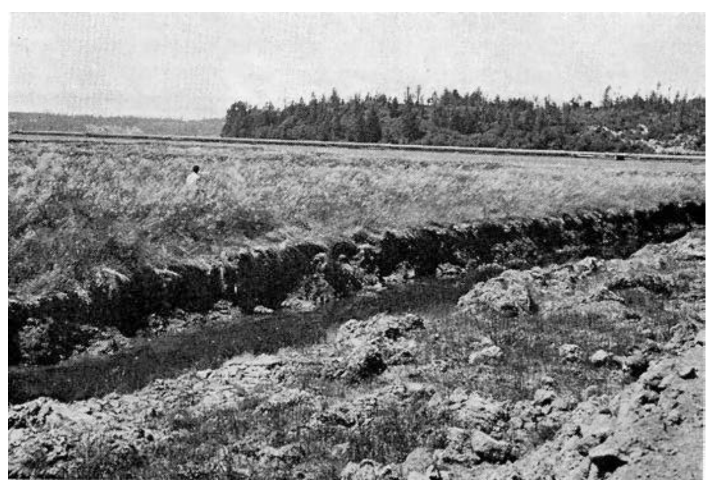

Figure 3.—**A drained area of a Clatsop soil. Where drained and diked to prevent tidal overflow, this soil is used for pasture, forage, and vegetable crops.**

wetland wildlife, but it is not suitable for campgrounds unless it is drained and protected from floods. Capability unit VIw-1, not placed in a forest management group.

Colluvial and Alluvial Land

Colluvial and Alluvial land (Cu) is nearly level to sloping and occupies long, narrow, winding areas along minor tributaries. It consists of sandy or loamy alluvial and colluvial material that was washed or moved from the side slopes of mountains. Alluvial land generally has slopes of less than 5 percent. Slopes of Colluvial land are short but average about 10 percent, though they range to 30 percent. Colluvial land occupies about two-thirds and Alluvial one-third of the areas mapped as this unit. Colluvial land is 1 to 3 feet deeper than adjacent soils upslope.

This mapping unit is used for timber production. Colluvial land is suited to conifers, and Alluvial land is suited to hardwoods, mainly red alder. Frequent hazards, however, are flooding on Alluvial land and slides on Colluvial land. The unit is suited to use for small campgrounds if it is protected from flooding in winter and if the colluvial slopes are drained. The mapping unit is used as habitat for big game, especially in clear-harvested areas, and big-game hunting is an important recreation use, Capability unit VIe-1; forest management group 5.

Depoe Series

The Depoe series consists of nearly level, poorly drained soils that formed in stratified marine sediments overlying old stabilized dune sands along the Pacific Coast of Oregon. These soils formed under shore pine, hemlock, and Sitka spruce having a dense understory composed mainly of rhododendron, salal, red huckleberry, and evergreen huckleberry. Elevations range from 0 to 250 feet. The average annual precipitation is 65 to 90 inches. The average annual air temperature is about 51° F., and the average frost-free period is about 225 days. Depoe soils are associated with Lint, Fendall, and Ferrelo soils.

In a representative profile, the surface layer is very dark gray silt loam about 7 inches thick. This layer is covered with about 4 inches of very dark brown and black peat that contains many roots. The subsurface layer is dark grayish-brown and olive-brown, mottled clay loam about 9 inches thick. The upper part of the subsoil is about 3 inches of light yellowish-brown loam. The lower part is a yellowish-brown, mottled hardpan about 10 inches thick. The substratum is yellowish-brown sand that is weakly cemented in places and extends to a depth of more than 60 inches.

Depoe silt loam (De).—This soil is nearly level or slightly depressed and occurs on old stabilized dunes.

Representative profile, about 20 feet west of the gravel road and about 25 feet south of the logging spur road to the west in the NE¼SE¼NE¼SW¼ sec. 30, T. 13 S., R. 12 W., about 1 mile south of Waldport in Lincoln County:

O1—5 to 4 inches, needles and salal leaves; loose.

O2—4 inches to 0, very dark brown and black (10YR 2/2 and 2/1) humus with many roots; extremely acid.

A1—0 to 7 inches, very dark gray and very dark grayish-brown (10YR 3/1 and 3/2) silt loam, gray (10YR 5/1) when dry; weak, medium, angular, blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few roots; few very fine tubular pores; very strongly acid; abrupt, smooth boundary. (4 to 8 inches thick)

A21g—7 to 13 inches, dark grayish-brown (2 5Y 4/2) clay loam, light brownish gray (2 5Y 6/2) when dry; many, coarse, prominent, yellowish-red (5YR 4/6) mottles; massive; slightly hard, friable, slightly sticky, slightly plastic; thin indurated layer at top and base of this horizon; few very fine tubular pores; few, very firm, medium gravel-size nodules; very strongly acid; abrupt, smooth boundary. (5 to 7 inches thick)

A22g—13 to 16 inches, olive-brown (2 5Y 4/3) clay loam, pale yellow (2 5Y 7/3) when dry; many, medium, distinct mottles; weak, medium, subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few very fine tubular pores; very strongly acid; abrupt, smooth boundary. (2 to 5 inches thick)

IIB21ir—16 to 19 inches, light yellowish-brown (2.5Y 6/4) loam, yellow (10YR 7/6) when dry; massive; hard, friable, sticky, plastic; many, hard, firm, strong-brown (7.5YR 5/6) and dark reddish-brown (2 5YR 2/4) nodules; extremely acid; abrupt, smooth boundary. (2 to 5 inches thick)

IIIB22ir—19 to 29 inches, highly variegated, yellowish-brown (10YR 5/8 to 5/6), indurated ortstein; common yellowish-red (5YR 5/8) and few light olive-brown (2 5Y 5/4) mottles; massive; extremely hard, extremely firm; very strongly acid; abrupt, wavy boundary (7 to 15 inches thick)

IVC—29 to 60 inches, yellowish-brown (10YR 5/8) sand; few, yellowish-red (5YR 5/8) mottles; single grain; generally loose when dry or moist, but firm and weakly cemented in places; extremely acid.

The texture of the A1 and A2g horizons ranges from loam to clay loam. The A2g horizon extends downward to a depth of about 15 to 20 inches.

Permeability is very slow, and the effective rooting depth is limited by the indurated B22ir horizon. Runoff is very slow or ponded, and water commonly stands on this soil in winter. The available water holding capacity is 3 to 4 inches. Roots are confined to the O and A1 horizons.

This Depoe soil is used for timber production and water supply. It provides limited wildlife habitat. It is not suitable for recreation. because of a subsurface hardpan, a high water table, and the nuisance of mosquitoes. Capability unit VIw-2, forest management group 6.

Desolation Series

The Desolation series consists of deep, well-drained, sloping to moderately steep soils that formed in alluvial and colluvial materials derived from weathered basalt. These soils are in the mountains of the Coast Range where they formed under Douglas-fir and hemlock having an understory of a salal—swordfern plant community. Also, there are hardwood stands in which the understory is a salmonberry—swordfern plant community. Elevations range from 300 to 1,700 feet. Average precipitation is 60 to 100 inches. Average annual air temperature is about 49° F., and the frost-free season is 210 days. Desolation soils are associated with Skinner and Fendall soils.

In a representative profile, the surface layer is 8 inches thick and consists of very dark brown clay loam and dark reddish-brown clay that contains a few pebbles. This is covered with a 7-inch layer of salal and hemlock

litter and black, decomposed, organic litter. The upper part of the subsoil is dark-brown and brown clay, about 42 inches thick. The lower part of the subsoil is brown very gravelly clay that extends to a depth of 90 inches or more.

Desolation clay loam, 10 to 35 percent slopes (DfE).—This soil is in the mountains.

Representative profile, on the north side of a logging spur road in the northwest corner of SW¼NW¼SE¼ sec. 9, T. 14 S., R. 11 W., about 6 miles southeast of Waldport in Lincoln County:

O1—7 to 4 inches, salal and hemlock litter.
O2—4 inches to 0, black, decomposed, organic litter.
A1—0 to 3 inches, very dark brown (7.5YR 2/2) clay loam, very dark brown (7.5YR 2/3) when dry; strong, very fine, granular structure; slightly hard, friable, sticky, slightly plastic; many roots; many fine and very fine irregular pores, few pebbles and concretions; extremely acid; clear, smooth boundary. (3 to 8 inches thick)
A3—3 to 8 inches, dark reddish-brown (5YR 2/3) clay, dark reddish brown (5YR 3/3) when dry; strong, fine, subangular blocky structure; slightly hard, friable, sticky, plastic, many roots; many fine and very fine irregular pores; few pebbles and cobblestones; very strongly acid; clear, wavy boundary. (4 to 7 inches thick)
B21—8 to 23 inches, dark-brown (7.5YR 4/4) clay, strong brown (7.5YR 5/6) when dry; weak, fine and medium, subangular blocky structure; hard, friable, sticky, plastic; common roots; many very fine tubular pores; 5 percent pebbles and cobblestones; very strongly acid; clear, smooth boundary. (10 to 20 inches thick)
B22—23 to 50 inches, brown (7.5YR 4/4) clay, strong brown (7.5YR 5/6) when dry; few, fine, faint and distinct, strong-brown, and reddish-yellow mottles; weak, very fine, subangular blocky structure; few roots; common very fine tubular pores; 10 percent cobblestones and stones; very strongly acid; diffuse, smooth boundary. (20 to 30 inches thick)
IIB3—50 to 90 inches, brown (7.5YR 4/4) very gravelly clay, strong brown (7.5YR 5/6) when dry; weak, fine, subangular blocky structure; hard, firm, sticky, plastic; few roots; common very fine tubular pores; 55 percent pebbles and cobblestones; very strongly acid.

Depth to bedrock is 7 to 10 feet or more. Coarse fragments make up 15 to 30 percent of the A horizon, as much as 50 percent of the B2 horizon, and 50 to 80 percent of the volume at depths of 40 inches or more.

Included with this soil in mapping were a few areas of Skinner, Fendall, and Hembre soils.

This soil has moderately slow permeability. Runoff is medium, and the hazard of erosion is moderate. The available water holding capacity is 7 to 10 inches. Effective rooting depth is 60 inches or more.

This Desolation soil is used for timber production and water supply. It supports a large population of big game and game birds. Brush and herbaceous plants growing in the cleared, harvested areas are very palatable. Birds feed on several kinds of berries and obtain gravel and grit from the soil. Hunting is the main recreation use. This soil is suitable for campgrounds if compaction of the surface layer is minimized. Capability unit VIe-3, forest management group 2.

Digger Series

The Digger series consists of well-drained, gently sloping to very steep soils that formed in alluvial and colluvial material derived from sandstone. These soils formed under Douglas-fir and some bigleaf maple. A vine maple—salal or an ocean spray—salal plant community is characteristic in the understory. Elevations range from 200 to 1,800 feet. Average annual precipitation is 60 to 80 inches, average annual air temperature is 51° F., and the average frost-free season is 180 days. Digger soils are associated with Apt, Bohannon, Hatchery, and Honeygrove soils.

In a representative profile, the surface layer is dark grayish-brown and dark-brown gravelly loam about 4 inches thick. The subsoil, about 26 inches thick, is brown gravelly loam that is 45 percent pebbles and cobblestones. It is underlain by fractured sandstone that has soil material in the fractures.

Digger gravelly loam, dissected, 50 to 75 percent slopes (DIG).—This soil is on the dissected sides of the mountains.

Representative profile, on the south slope above spur road, where this road runs westward after passing first abandoned landing on ridge and sharp corner caused by drainageway, in the south half of SE¼SW¼NW¼ sec. 10, T. 14 S., R. 7 W., about 3½ miles east-southeast of Alsea in Benton County:

O1—½ inch to 0, intermittent horizon of raw litter, needles, cones, and small branches.
A1—0 to 4 inches, very dark grayish-brown and dark-brown (10YR 3/2 and 3/3) gravelly loam, light brownish gray (10YR 6/2) when dry; moderate, medium to fine, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many roots; many irregular pores; 40 percent pebbles, strongly acid; clear, smooth boundary. (4 to 7 inches thick)
B1—4 to 18 inches, brown (10YR 4/3) gravelly loam, light brownish gray (10YR 6/2) when dry; weak, very fine, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many roots; common very fine pores; 20 percent coarse fragments, strongly acid, clear, smooth boundary. (4 to 14 inches thick)
B2—18 to 30 inches, brown (10YR 4/3) gravelly loam, pale brown (10YR 6/3 when dry; weak and moderate, medium, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine roots; common very fine pores, few, thin, dark-brown (10YR 3/3) clay films on rock fragments and in pores; 45 percent coarse fragments; very strongly acid; abrupt, broken boundary. (10 to 24 inches thick)
IIR—30 to 40 inches, partially consolidated, fractured sandstone; soil material similar to that in the B2 horizon in fractures.

The B horizon is 35 to 50 percent pebbles and cobblestones. Depth to bedrock is 20 to 40 inches

Included with this soil in mapping were some areas of Trask soils and a few acres of Apt soils.

This soil has moderately rapid permeability. Runoff is very rapid, and the erosion hazard is very high. The available water holding capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches.

Among the uses of this Digger soil are timber production and water supply. Big-game animals overgraze the few palatable shrubs and herbaceous plants in areas that have been clear harvested. The soil is suited to such recreational uses as hunting and fishing, but it is not suitable for campgrounds, because of slope and the ero-

sion hazard. Capability unit VIIe–2, forest management group 12.

Digger gravelly loam, 20 to 37 percent slopes (DgE).—This soil is similar to Digger gravelly loam, dissected, 50 to 75 percent slopes, but it is undissected and is sloping to moderately steep. In most places the depth to bedrock is 30 to 40 inches and the subsoil is 40 percent pebbles and cobblestones. Included in mapping were some areas of Honeygrove and Apt soils. Runoff is medium on this soil, and the erosion hazard is moderate. Capability unit VIe–2, forest management group 7.

Digger gravelly loam, 37 to 50 percent slopes (DgF).—This soil is similar to Digger gravelly loam, dissected, 50 to 75 percent slopes, except that it has undissected, steep slopes. Included in mapping were areas of Apt and Honeygrove soils. Runoff is rapid on this soil, and the erosion hazard is high. Capability unit VIe–5, forest management group 8.

Digger gravelly loam, 50 to 75 percent slopes (DgG).—This soil is similar to Digger gravelly loam, dissected, 50 to 75 percent slopes, but it has undissected slopes. At the foot of long slopes, this soil is 4 to 5 feet deep. Included in mapping were some areas of Trask soils, mostly on the upper one-third of the slopes. Runoff is very rapid, and the erosion hazard is very high. Capability unit VIIe–2, forest management group 10.

Digger gravelly loam, dissected, 37 to 50 percent slopes (DlF).—This soil is similar to Digger gravelly loam, dissected, 50 to 75 percent slopes, but it is not so steep. The subsoil is about 35 percent pebbles and cobblestones. In most places depth to bedrock is 40 inches. Included with this soil in mapping were areas that have slopes of less than 37 percent. Also included were gently sloping Apt and Honeygrove soils in areas between drainageways. Runoff is rapid on this soil, and the erosion hazard is high. Capability unit VIe–5, forest management group 9.

Digger gravelly loam, ridge, 5 to 37 percent slopes (DmE).—This soil is similar to Digger gravelly loam, dissected, 50 to 75 percent slopes, but it is gently sloping to moderately steep and occupies long, narrow, undissected ridges. It is 30 to 40 inches deep, and its subsoil is about 40 percent pebbles and a few cobblestones. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping were a few areas of Honeygrove soils. Also included were a few saddles and knolls, and these are indicated on the soil map.

The soil is suitable for campgrounds on the lesser slopes, but the windthrow hazard is high and poison-oak is present in places. Capability unit VIe–2, forest management group 7.

Digger-Apt complex, 25 to 37 percent slopes (DpE).—This complex is 55 percent Digger gravelly loam, 20 to 37 percent slopes, and 45 percent Apt clay, 5 to 25 percent slopes. In most places, the Digger soil is about 40 inches deep. Runoff is medium, and the erosion hazard is moderate. Capability unit VIe–2, forest management group 7.

Digger-Apt complex, 37 to 60 percent slopes (DpF).—This complex is 60 to 65 percent Digger gravelly loam, 37 to 50 percent slopes, and 35 percent Apt clay, 5 to 25 percent slopes. Digger gravelly loam, 50 to 75 percent slopes, makes up 5 percent of some areas, but its slopes are rarely more than 60 percent. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 8.

Digger-Apt complex, dissected, 25 to 37 percent slopes (DsE).—This complex is 55 percent Digger gravelly loam, dissected, having slopes between 25 and 37 percent, and it is 45 percent Apt clay, 5 to 25 percent slopes. In most places the Digger soil is 30 to 40 inches deep. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIe–2, forest management group 9.

Digger-Apt complex, dissected, 37 to 60 percent slopes (DsF).—In this complex small areas of Apt soils are so closely intermingled with larger areas of Digger soils that mapping them separately is impractical. The complex is 60 to 65 percent Digger gravelly loam, dissected, 37 to 50 percent slopes, and 35 percent Apt clay, 5 to 25 percent slopes. The Digger soil is 30 to 40 inches deep. Some of the mapped areas are 5 percent Digger gravelly loam, dissected, 50 to 75 percent slopes, though slopes of this soil rarely exceed 60 percent. Rock outcrops are common along the drainageways. Runoff is rapid, and the erosion hazard is high. Capability unit VIe–5, forest management group 9.

Dune Land

Dune land (Du) is near the mouth of Alsea Bay and consists of dunes and beach sand. The dunes are not stabilized, and they change positions as the sand particles are drifted and piled up by the wind. Pools of fresh water are in some of the depressions between the dunes, but they generally disappear by late summer. These intermittent pools probably represent the fluctuating surface of an underground reservoir of fresh water. Areas of Dune land primarily are used for recreation. Capability unit VIIIs–1, not placed in a forest management group.

Fendall Series

The Fendall series consists of well-drained, moderately steep to very steep soils that developed in alluvial and colluvial materials derived from shale. These soils developed under Douglas-fir and Sitka spruce having an understory of a salal—swordfern or a salmonberry—swordfern plant community. Elevations range from 0 to 250 feet in a marine climate that has an average annual precipitation of 60 to 80 inches. The average annual air temperature is about 51° F., and the average frost-free period is about 225 days. Fendall soils are associated with Depoe, Desolation, Lint, and Skinner soils.

In a representative profile, the surface layer is black and very dark brown gravelly clay loam and clay loam about 13 inches thick. The subsoil is yellowish-brown clay about 18 inches thick. Fractured shale bedrock is at a depth of 31 inches.

Fendall gravelly clay loam, 37 to 50 percent slopes (FdF).—This soil has steep slopes and is in mountains.

Representative profile near a road cut on north side at junction of second private road to right with Alder Grove Cemetery road in the NE¼NE¼SE¼ sec. 32, T. 13 S., R. 11 W., about 3 miles south-southeast of Waldport in Lincoln County:

O1—1 inch to 0, salal leaves and Douglas-fir litter.

A1—0 to 4 inches, black (10YR 2/1) gravelly clay loam, very dark gray (10YR 3/1) when dry; strong, very fine, granular structure; soft, very friable, slightly sticky, slightly plastic; many roots; many very fine and fine irregular pores; 20 percent pebbles; very strongly acid, abrupt, smooth boundary (4 to 6 inches thick)

A3—4 to 13 inches, very dark brown (10YR 2/2) clay loam, very dark grayish-brown (10YR 3/2) when dry; few brown-colored soil aggregates; strong, fine, angular blocky structure and very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many fine irregular pores; few fine pebbles; very strongly acid; abrupt, smooth boundary. (7 to 12 inches thick)

B2—13 to 21 inches, yellowish-brown (10YR 5/4) clay, light yellowish brown and yellowish-brown (10YR 6/5 and 5/4) when dry; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; few roots; common very fine tubular pores; few, thin, darker-colored coatings; few pebbles; very strongly acid; gradual, wavy boundary. (6 to 10 inches thick)

B3—21 to 31 inches, yellowish-brown (10YR 5/8), yellowish-red (5YR 3/6), and yellowish-brown (10YR 5/4) clay, colors are listed in order of dominance; yellow (10YR 7/6 and 7/8) when dry; weak, fine, subangular blocky structure; hard, friable, sticky, plastic; few roots; few very fine tubular pores; few thin clay coatings on shale fragments; 40 percent partially weathered shale pebbles; extremely acid; clear, wavy boundary. (2 to 12 inches thick)

IIC—31 to 38 inches, fractured, yellowish-brown shale; a few roots in the upper 3 inches.

Depth to bedrock ranges from 20 to 40 inches. Content of coarse fragments above the C horizon ranges from about 5 to 50 percent.

This soil has moderately slow permeability. Runoff is medium, and the hazard of erosion is high. The available water holding capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches.

This Fendall soil is used for timber production and water supply. It is not suitable for campgrounds, because of slope and the terrain. Hunting is the main recreation use. Big-game animals are observed frequently on this soil, which produces an abundant supply of palatable brush and herbs. Capability unit VIe-3, forest management group 6.

Fendall gravelly clay loam, 25 to 37 percent slopes (FdE).—This soil is similar to Fendall gravelly clay loam, 37 to 50 percent slopes, but it has moderately steep slopes. Pebbles make up about 30 percent of the subsoil, and the entire soil is 30 to 40 inches deep. Runoff is slow, and the hazard of erosion is moderate. Capability unit VIe-3, forest management group 6.

Fendall gravelly clay loam, 50 to 75 percent slopes (FdG).—This soil is similar to Fendall gravelly clay loam, 37 to 50 percent slopes, but it has very steep slopes. Pebbles make up about 30 percent of the surface layer and about 35 percent of the subsoil. Depth to bedrock generally is 30 to 40 inches. Runoff is rapid, and the hazard of erosion is very high. Capability unit VIIe-1, forest management group 11.

Ferrelo Series

The Ferrelo series consists of well-drained, gently sloping to moderately steep soils that developed in unconsolidated sandy sediments on marine terraces (fig. 4). These soils formed under Douglas-fir having an understory of a salal—swordfern, a salmonberry—swordfern, or a swordfern plant community. Rhododendron and azalea also are in the plant cover. Elevations range from 15 to 400 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is about 52° F., and the average frost-free period is about 225 days. Ferrelo soils are associated with Depoe, Fendall, and Lint soils.

In a representative profile, the surface layer is 10 inches thick and consists of dark-brown loamy fine sand and loam. The subsoil is strong-brown fine sandy loam about 8 inches thick. The underlying material is a brown sandy loam about 54 inches thick.

Ferrelo loam, 5 to 30 percent slopes (FeD).—This gently sloping to moderately steep soil is on marine terraces.

Figure 4.—**Profile of a Ferrelo soil.**

Representative profile, along north road cut about 75 feet east of the spur road to the north of the ridge in the west half of NE¼SW¼SE¼ sec. 19, T. 13 S., R. 11 W., about one-fourth mile south of Waldport in Lincoln County:

O1—6 inches to 0, organic layer with abundant roots.

A11—0 to 2 inches, dark-brown and very dark brown (10YR 3/3 and 2/2) loamy fine sand, dark brown (7.5YR 4/3) when dry; single grain; loose when dry or moist; common roots; common irregular pores; very strongly acid; abrupt, smooth boundary. (2 to 6 inches thick)

IIA12—2 to 10 inches, dark-brown (7.5YR 3/2) loam, brown (7.5YR 4/3) when dry, moderate, fine, subangular blocky structure; slightly hard, friable but has a few firm aggregates, slightly sticky, nonplastic; common roots; common very fine tubular pores; very strongly acid; abrupt, smooth boundary. (4 to 8 inches thick)

IIB2—10 to 18 inches, strong-brown (7.5YR 4/6) fine sandy loam, strong brown (7.5YR 5/6) when dry; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; few roots, few very fine tubular pores; common, firm, stained sandstone and cobblestone fragments; strongly acid; abrupt, wavy boundary. (6 to 22 inches thick)

IIC—18 to 72 inches, brown (10YR 4/3) sandy loam, very pale brown (10YR 7/3) when dry; massive; slightly hard, friable and firm, sticky and slightly plastic; few roots in upper part; many very fine irregular pores; strongly acid.

Included with this soil in mapping were areas of a soil that has a loamy sand texture in the subsoil This texture gradually changes with depth to sand layers that are slightly hard Also included were a few areas of Depoe and Fendall soils

This soil has moderately rapid permeability. Surface runoff is slow. The hazard of water erosion is only slight, but the risk of soil blowing is moderate. The available water holding capacity is 7 to 9 inches. Effective rooting depth is 60 inches or more, although most roots are in the upper 18 inches.

This Ferrelo soil is used for timber production and water supply. In some places it is used for homesites, and many areas offer a panoramic view of the coastline. The soil is suitable and well located for campgrounds, but these must be carefully designed to minimize the high hazard of windthrow and the moderate risk of soil blowing. Big-game animals occasionally inhabit areas of this soil, and hunting pressure is light. Capability unit VIe–3, forest management group 13.

Hatchery Series

The Hatchery series consists of well-drained, moderately steep to extremely steep soils that developed in alluvial and colluvial materials derived from basalt. These soils formed under Douglas-fir and a small amount of Oregon oak and grand fir. The understory is a vine maple—salal or an ocean spray—salal plant community. Elevations range from 250 to 1,500 feet. The average annual precipitation is 60 to 80 inches. The average annual air temperature is about 52° F., and the average frost-free period is about 180 days. Hatchery soils are associated with Digger, Klickitat, Honeygrove, and Kilchis soils.

In a representative profile, the surface layer is dark-brown gravelly loam about 9 inches thick. The subsoil is dark reddish-brown gravelly loam about 23 inches thick. The underlying material is fractured basalt.

Hatchery gravelly loam, dissected, 50 to 85 percent slopes (HcG).—This very steep to extremely steep soil is in the mountains.

Representative profile, 30 feet north of South Fork Road and 50 yards east of Hull-Oakes quarry and centered along lower boundary of S½SE¼SW¼NE¼ sec. 20, T. 14 S., R. 7 W., along South Fork Road about 3½ miles southeast of Alsea in Benton County:

O1—1 inch to 0, mostly Douglas-fir and salal leaves; an O2 horizon one-fourth inch thick at the lower boundary.

A1—0 to 9 inches, dark-brown (7.5YR 3/2) gravelly loam, dark brown (7.5YR 4/4) when dry; moderate, very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many fine and very fine irregular pores; 20 percent basalt pebbles; strongly acid; abrupt, smooth boundary. (7 to 10 inches thick)

B21—9 to 21 inches, dark reddish-brown (5YR 3/4) gravelly loam, yellowish red (5YR 5/6) when dry; moderate, very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common roots; many fine and very fine irregular and tubular pores; 30 percent small pebbles; some cobblestones; strongly acid; gradual, smooth boundary. (5 to 15 inches thick)

B22—21 to 32 inches, dark reddish-brown (5YR 3/4) gravelly loam, yellowish red (5YR 5/6) when dry; moderate to weak, very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few roots; many fine and very fine irregular and tubular pores; 45 percent pebbles and about 10 percent cobblestones; very strongly acid; abrupt, irregular boundary (5 to 15 inches thick)

R—32 to 45 inches, fractured basalt.

Depth to basalt bedrock ranges from 20 to 40 inches Coarse fragments make up 30 to 60 percent of the B21 horizon and 80 percent of the B22 horizon In places the texture is clay loam instead of loam There are rock outcrops along the drainages.

Included with this soil in mapping were areas of Honeygrove and Kilchis soils.

Permeability of this soil is moderately rapid. Runoff is very rapid where this soil is cleared, and the hazard of erosion is very high. The available water holding capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches.

This Hatchery soil is used for timber production and water supply. It is too steep and dissected for use as campgrounds. Game animals and birds are observed frequently. Brush and herbaceous plants provide moderate quantities of browse for deer. Grouse and pigeon feed on salal berries and obtain basalt sand for grit from the soil. The soil is suited to such recreation use as hunting and fishing. Capability unit VIIe–2, forest management group 11.

Hatchery gravelly loam, 25 to 37 percent slopes (HaE).—This soil is similar to Hatchery gravelly loam, dissected, 50 to 85 percent slopes, but it has undissected, moderately steep to steep slopes. Included in mapping were a few areas of Honeygrove soils. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIe–2, forest management group 7.

Hatchery gravelly loam, 37 to 50 percent slopes (HaF).—This soil is similar to Hatchery gravelly loam, dissected, 50 to 85 percent slopes, but it has steep, undissected slopes. There are a few rock outcrops. Ridges and

headwalls are indicated on the soil map by appropriate symbols. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 8.

Hatchery gravelly loam, 50 to 85 percent slopes (HaG).—This soil is similar to Hatchery gravelly loam, dissected, 50 to 85 percent slopes, but it has undissected slopes. Pebbles and cobblestones make up 50 percent of the subsoil. Included in mapping were areas of Honeygrove and Kilchis soils. Rock outcrops occur along the drainages. Runoff is very rapid, and the hazard of erosion is very high. Capability unit VIIe–2, forest management group 11.

Hatchery gravelly loam, dissected, 37 to 50 percent slopes (HcF).—This soil is similar to Hatchery gravelly loam, dissected, 50 to 85 percent slopes, but it has steep slopes. In some places pebbles and cobblestones make up 20 to 65 percent of the surface layer. Included in mapping were areas where bedrock is at a depth of 60 inches. Also included were small areas of Honeygrove and Kilchis soils, and a moderate number of rock outcrops. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 9.

Hatchery-Honeygrove complex, 25 to 37 percent slopes (HeE).—This complex consists of small areas of Honeygrove soils that are so closely intermingled with areas of Hatchery soils that mapping them separately is impractical. The complex is about 70 percent Hatchery gravelly loam, 25 to 37 percent slopes, and about 30 percent Honeygrove clay, basalt substratum, 0 to 25 percent slopes. Included in mapping were areas of Honeygrove soils that have moderately steep slopes. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIe–2, forest management group 7.

Hatchery-Honeygrove complex, 37 to 50 percent slopes (HeF).—This complex consists of small areas of Honeygrove soils that are so closely intermingled with areas of Hatchery soils that mapping them separately is impractical. The complex is about 70 percent Hatchery gravelly loam, 37 to 50 percent slopes, and about 30 percent Honeygrove clay, basalt substratum, 25 to 37 percent slopes. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 8.

Hatchery-Honeygrove complex, dissected, 25 to 37 percent slopes (HgE).—This complex consists of small areas of Honeygrove soils that are so closely intermingled with areas of Hatchery soils that mapping them separately is impractical. The complex is about 70 percent Hatchery gravelly loam, dissected, 37 to 50 percent slopes, and about 30 percent Honeygrove clay, basalt substratum, 0 to 25 percent slopes. Runoff is medium, and the hazard of erosion is high. Capability unit VIe–2, forest management group 9.

Hatchery-Honeygrove complex, dissected, 37 to 50 percent slopes (HgF).—In this complex, small areas of Honeygrove soils are so closely intermingled with areas of Hatchery soils that mapping them separately is impractical. The complex is about 70 percent Hatchery gravelly loam, dissected, 37 to 50 percent slopes, and about 30 percent Honeygrove clay, basalt substratum, 25 to 37 percent slopes. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 9.

Hebo Series

The Hebo series consists of nearly level to poorly drained soils that are on concave or smooth alluvial terraces. These soils formed under spruce, hemlock, and alder having an understory of rushes, sedges, willows, and skunk cabbage. Elevations range from 20 to 300 feet. The average annual precipitation is 60 to 100 inches. The average annual air temperature is 51° F., and the frost-free period is about 180 days. Hebo soils are associated with Chitwood and Knappa soils.

In a representative profile, the surface layer is about 19 inches thick and consists of very dark gray and black silty clay loam and silty clay that contains a few, distinct, dark-brown and dark yellowish-brown mottles. The subsoil, about 29 inches thick, is very dark gray or dark-gray silty clay or silty clay loam that contains many, distinct, dark-brown mottles.

Hebo silty clay loam (Hh).—This nearly level soil occupies concave or smooth alluvial terraces.

Representative profile, 75 feet northeast of the lone oak tree in a pasture in the NE¼SE¼ sec. 8, T. 14 S., R. 8 W.:

O1—½ inch to 0, litter of dead grass and sedges.

Ap—0 to 9 inches, very dark gray (10YR 3/1) silty clay loam; dark gray (10YR 4/1) when dry; few, fine, distinct, dark-brown (7.5YR 4/4) mottles along root channels; moderate to strong, very fine and fine, granular structure, hard, friable, sticky, plastic; many roots; common very fine irregular pores and few very fine tubular pores; very strongly acid, clear, smooth boundary. (4 to 10 inches thick)

A3—9 to 19 inches, black (2.5Y 2/2) silty clay, dark gray (10YR 4/1) when dry; common, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; strong, fine, granular structure; hard, very firm, sticky, plastic; many roots; common fine irregular pores and common very fine tubular pores; very strongly acid; clear, smooth boundary. (7 to 12 inches thick)

B2tg—19 to 35 inches, very dark gray (5Y 3/1) silty clay, gray (5Y 5/1) when dry; light-gray (5Y 7/1) silt or very fine sand grains on peds; many, fine, distinct, dark-brown (10YR 4/3) mottles; strong, medium, angular blocky structure; very hard, very firm, very sticky, plastic; few roots; few very fine and few large tubular pores; common thin clay films; very strongly acid; clear, smooth boundary (12 to 18 inches thick)

B3g—35 to 48 inches, dark-gray (5Y 4/1) silty clay loam, light gray (5Y 6/1) when dry; many, fine, distinct, dark-brown (10YR 4/3) mottles; weak, medium, angular blocky structure; hard, firm, sticky, plastic; few roots; few very fine tubular pores; thin discontinuous clay films; few reddish-brown and black concretions and coatings; medium acid.

The A horizon may be black and may lack mottles. In some places lenses of sand, silt, or pebbles are in the lower part of the B and in the C horizon.

Included with this soil were areas of Chitwood soils.

This soil has moderately slow permeability. Runoff is slow or ponded, and the hazard of erosion is only slight. The available water holding capacity is 8 to 9 inches. This soil has a high water table, and unless it is drained, the effective rooting depth for water-sensitive crops is limited to the upper 20 inches. For water-tolerant grasses, the effective rooting depth is more than 60 inches.

This Hebo soil is used for pasture after it is drained. It is poorly suited to use for campgrounds because surface water accumulates after heavy rainfall and the sur-

face layer is sticky. Big-game animals occasionally graze the vegetation on this soil. Capability unit IVw–2, not placed in a forest management group.

Hembre Series

The Hembre series consists of well-drained, gently sloping to sloping soils that formed in residuum and in alluvial and colluvial materials derived from basalt and breccia. These soils formed under Douglas-fir, hemlock, and alder having an understory of a salal—swordfern or a vine maple—salal plant community. Elevations range from 200 to 2,800 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is about 49° F., and the frost-free period is about 180 days. Hembre soils are associated with Kilchis, Klickitat, Astoria, and Blachly soils.

In a representative profile, the surface layer is dark reddish-brown clay loam about 17 inches thick. The upper part of the subsoil is dark reddish-brown or dark-brown clay loam about 63 inches thick. The lower part of the subsoil is dark yellowish-brown very cobbly clay. Basalt is at a depth of about 120 inches.

Hembre clay loam, 5 to 25 percent slopes (HlD).—This soil is gently sloping to sloping and occurs in the mountains.

Representative profile on east side of road, about 2 miles south of junction with Dicks Fork road in an oversize section; if a normal section is plotted in the south part of this oversize section, then site is in the southwest corner of SE¼NW¼ sec. 5 (oversize), T. 14 S., R. 11 W., about 4 miles southeast of Waldport in Lincoln County:

O1—2 inches to 0, litter from Douglas-fir and salal.

A11—0 to 2 inches, dark reddish-brown (5YR 2/2) clay loam, dark reddish brown (5YR 3/2) when dry; moderate to strong, very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many very fine irregular pores; 10 percent fine pebbles; very strongly acid; abrupt, smooth boundary (2 to 5 inches thick)

A12—2 to 17 inches, dark reddish-brown (5YR 3/2) clay loam, reddish brown (5YR 4/4) when dry; moderate, fine and very fine, granular structure; slightly hard, friable; slightly sticky, slightly plastic; many roots; many very fine irregular and few fine pebbles; very strongly acid; gradual, smooth boundary. (12 to 18 inches thick)

B1—17 to 36 inches, dark reddish-brown (5YR 3/4) clay loam, reddish brown (5YR 5/4) when dry; moderate, very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common roots; many very fine tubular pores; few fine pebbles; very strongly acid; gradual, smooth boundary. (10 to 19 inches thick)

B21—36 to 52 inches, dark reddish-brown (5YR 3/4) clay loam, reddish brown (5YR 5/4) when dry; moderate, very fine, subangular blocky structure; hard, friable, sticky, plastic; common roots; common very fine tubular pores; few thin coatings on peds; very strongly acid; abrupt, wavy boundary. (6 to 16 inches thick)

B22—52 to 80 inches, dark-brown (7.5YR 4/4) clay loam, brown (7.5YR 5/4) when dry; moderate, very fine, subangular blocky structure; hard, firm, sticky, plastic; few roots; common very fine tubular pores; few very thin coatings on peds; few weathered pebbles; very strongly acid; gradual, wavy boundary. (20 to 30 inches thick)

IIB3—80 to 120 inches, dark yellowish-brown (10YR 4/4) very cobbly clay; yellowish brown (10YR 5/6) when dry; weak, fine, subangular blocky structure; hard, firm, sticky, plastic; few roots; common very fine tubular pores; 50 percent weathered basalt cobblestones; few thin coatings on peds; very strongly acid; clear, irregular boundary.

IIR—120 inches, basalt

Depth to bedrock is 80 to 130 inches. This soil is deeper to bedrock than typical Hembre soils. Pebbles and cobblestones make up 10 to 15 percent of the A horizon in some places.

Included with this soil in mapping were areas of Skinner soils.

This soil has moderate permeability. Runoff is medium to rapid, and the hazard of erosion is moderate. The available water holding capacity is 11 to 13 inches. Effective rooting depth is 60 inches or more.

This Hembre soil is used for timber production and water supply. It is suitable for campgrounds. Hunting is the main recreation use. Big-game animals browse the palatable brush and herbaceous plants growing in areas previously clear harvested. Capability unit VIe–1, forest management group 5.

Honeygrove Series

The Honeygrove series consists of well-drained, nearly level to steep soils that formed in old alluvial and colluvial materials derived from sandstone, siltstone, and basalt. Honeygrove soils formed under Douglas-fir and western hemlock having an understory of a vine maple—salal, an ocean spray—salal, or a vine maple—swordfern plant community. Elevations range from 500 to 1,500 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is about 50° F., and the frost-free period is about 200 days. Honeygrove soils are associated with Apt, Bohannon, Digger, and Hatchery soils.

In a representative profile, the surface layer is dark reddish-brown clay about 12 inches thick (fig. 5). The subsoil is about 90 inches thick or more and consists of dark reddish-brown and dark-red clay. Bedrock is at depths of 4 to 12 feet and consists mainly of weathered sandstone or siltstone, but basalt is also present.

Honeygrove clay, uneven, 25 to 37 percent slopes (HsE).—This soil has moderately steep to steep uneven slopes and is in the mountains.

Representative profile on west side of the spur logging road in west half of SE¼NW¼ sec. 10, T. 14 S., R. 7 W., in the clearing on the bend in the gravel road about 3½ miles east-southeast of Alsea:

O1—1 inch to 0, mostly fresh brackenfern litter.

A1—0 to 6 inches, dark reddish-brown (5YR 2/3) clay, reddish brown (5YR 4/3) when dry; strong, very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many fine irregular pores; few fine concretions; few fine charcoal fragments; slightly acid; clear, wavy boundary. (4 to 6 inches thick)

A3—6 to 12 inches, dark reddish-brown (5YR 3/4) clay, reddish brown (5YR 4/4) when dry; strong, very fine, subangular blocky and granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; few fine interstitial pores; common very fine tubular pores; few cobblestones; few fine charcoal fragments; slightly acid; clear, irregular boundary. (0 to 7 inches thick)

B11—12 to 19 inches, dark reddish-brown (5YR 3/4) clay, reddish brown (5YR 4/4) when dry; few, thin, patchy, redder and darker coatings; strong, very fine,

Figure 5.—**Profile of a Honeygrove soil.**

subangular blocky structure; hard, friable, sticky, slightly plastic; many roots; many very fine tubular pores, few fine charcoal fragments; few pebbles; medium acid; clear, wavy boundary. (0 to 8 inches thick)

B12t—19 to 27 inches, yellowish-red (5YR 3/6) clay, yellowish red (5YR 4/6) when dry; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; common roots; many very fine tubular pores, few medium tubular pores; common thin clay films; medium acid; clear, wavy boundary (0 to 10 inches thick)

B21t—27 to 36 inches, dark-red (2.5YR 3/6) clay, red (2.5YR 4/6) when dry; moderate, medium and fine, subangular blocky structure; hard, friable, sticky, plastic; few roots; many very fine and few medium tubular pores; nearly continuous thin clay films on larger peds; few pebbles; strongly acid; gradual, smooth boundary (8 to 10 inches thick)

B22t—36 to 72 inches, dark-red (2.5YR 3/6) clay, red (2.5YR 4/6) when dry; moderate, fine, subangular blocky structure; hard, friable, sticky, plastic; few roots; many very fine tubular pores; nearly continuous, moderately thick, dark-red clay films on peds and in pores; few sandstone pebbles; strongly acid; gradual, smooth boundary (25 to 40 inches thick)

B23t—72 to 95 inches, dark-red (2.5YR 3/6) clay, red (2.5YR 4/6) when dry; moderate, fine, subangular blocky structure; hard, friable sticky, plastic sparse roots; common very fine tubular pores: few sandstone pebbles; continuous, moderately thick, dark-red clay films; strongly acid, gradual, smooth boundary. (0 to 25 inches thick)

B3t—95 to 105 inches, dark-red (2.5YR 3/6) clay, red (2.5YR 4/6) when dry; moderate to weak, fine, subangular blocky structure; hard, friable, sticky, plastic; very few roots; common very fine tubular pores; nearly continuous, moderately thick, dark-red clay films on peds; few sandstone pebbles; strongly acid.

The A horizon ranges from heavy silty clay loam to clay, and its content of pebbles may be as much as 15 percent. Weathered pebbles and cobblestones may make up as much as 25 percent of the B horizon Depth to bedrock ranges from 7 to 12 feet.

Included with this soil in mapping were areas of Apt soils.

This soil has moderately slow permeability. Runoff is rapid, and the hazard of erosion is high. The available water holding capacity is 8 to 10 inches. Effective rooting depth is 7 feet or more.

This Honeygrove soil is used for timber production and water supply. Big-game animals browse the few palatable species of herbaceous plants and brush growing in areas that have been clear harvested. Hunting is the main recreation use, but this soil is not suitable for campgrounds, because of slope and the hazard of erosion after soil compaction. Capability unit VIe-1, forest management group 2.

Honeygrove clay, basalt substratum, 0 to 25 percent slopes (HtD).—This soil is in the table on engineering test data (see table 2, p. 48).

Representative profile, about 15 feet west of the point where the old road turns from due south to southwest, in the north half of NE¼NW¼ sec. 21, T. 14 S., R. 7 W., about 3½ miles southeast of Alsea:

O1—1 inch to 0, litter of salal and brackenfern with a thin layer of humus beneath.

A11—0 to 3 inches, dark reddish-brown (5YR 2/2) clay, reddish brown (5YR 4/4) when dry; moderate to strong, very fine, granular structure; friable, slightly sticky, slightly plastic; common roots; many very fine interstitial pores; 5 percent gravel; very strongly acid; abrupt, smooth boundary (3 to 5 inches thick)

A12—3 to 7 inches, dark reddish-brown (5YR 3/4) clay, reddish brown (5YR 4/4) when dry; moderate, very fine, granular structure; friable, sticky, plastic; common roots; few fine tubular pores; 5 percent gravel; very strongly acid; abrupt, smooth boundary. (3 to 5 inches thick)

B1—7 to 17 inches, yellowish-red (5YR 3/6) clay, yellowish red (5YR 4/6) when dry; moderate, fine, subangular blocky structure; friable, sticky, plastic; common roots; few fine tubular pores; few thin clay films; 5 percent gravel; very strongly acid; clear, wavy boundary (10 to 12 inches thick)

B21t—17 to 33 inches, dark reddish-brown (2.5YR 3/4) clay, red (2.5YR 4/6) when dry; moderate, fine and very fine, subangular blocky structure; friable, sticky, plastic, few roots; common fine tubular pores; common moderately thick and few thick clay films on ped surfaces and in pores; 5 percent gravel; very strongly acid; clear, smooth boundary. (12 to 20 inches thick)

B22t—33 to 46 inches, dark-red (2.5YR 3/6) clay, red (2.5YR 4/6) when dry; weak, medium, prismatic structure parting to moderate, very fine, subangular blocky structure; firm, sticky, plastic; few roots; common fine tubular pores; common moderately thick clay films; few pebbles (5 percent); very strongly acid; clear, wavy boundary (10 to 15 inches thick)

B31—46 to 57 inches, yellowish-red (5YR 3/6) silty clay, yellowish red (5YR 5/6) when dry; weak to moderate, very fine, subangular blocky structure; friable, sticky, plastic; few roots; common fine tubular pores; common weathered basalt gravel (15 percent); very strongly acid; clear, wavy boundary. (10 to 15 inches thick)

B32—57 to 64 inches, yellowish-red (5YR 4/6 and 3/6) silty clay, yellowish red (5YR 5/6) when dry; weak, very fine, subangular blocky structure; friable, sticky, plastic; very few roots; few fine tubular pores; few thin clay films, 40 percent weathered basalt gravel; very strongly acid.

Weathered basalt bedrock is at depths ranging from 5 to 7 feet In some places the surface layer is clay loam. In places the content of pebbles and cobblestones is 25 percent.

Included in mapping were areas of Honeygrove clay, heavy variant, and Hatchery soils. Runoff is medium, and the hazard of erosion is slight.

After this soil has been protected from compaction and erosion, it is suitable for campgrounds. A study of the bedrock is important in the planning of sewage drainfields. Capability unit IVe–1, forest management group 1.

Honeygrove clay, 0 to 25 percent slopes (HmD).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it has nearly level to sloping, even slopes. This soil is in the mountains; it is about 4 feet deep. In places weathered pebbles make up 20 to 30 percent of the subsoil. The available water holding capacity is 6 to 8 inches. Runoff is medium, and the hazard of erosion is moderate.

If adequate provisions are made to provide surface drainage, this soil can be used for campgrounds but has only limited suitability for such use. The surface layer is sticky when wet and is readily compacted. Capability unit IVe–1, forest management group 1.

Honeygrove clay, 25 to 37 percent slopes (HmE).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes but it has even slopes. The soil is about 5 feet deep. Weathered pebbles and cobblestones make up 25 to 40 percent of the subsoil in some places. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–1, forest management group 1.

Honeygrove clay, 37 to 50 percent slopes (HmF).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it has steep, even slopes. In most places this soil is 4 to 5 feet deep. Weathered pebbles and cobblestones make up 30 to 45 percent of the subsoil. The available water holding capacity is 5 to 7 inches. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 1.

Honeygrove clay, dissected, 25 to 50 percent slopes (HnF).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it has dissected, moderately steep to steep slopes. This soil is about 5 feet deep. The available water holding capacity is 7 to 9 inches. Weathered cobblestones make up 10 to 40 percent of the subsoil. Runoff is rapid on this soil, and the hazard of erosion is high. Capability unit VIe–1, forest management group 3.

Honeygrove clay, dissected uneven, 25 to 37 percent slopes (HoE).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it has dissected slopes. Depth to bedrock is about 8 feet in most places. Weathered pebbles and cobblestones make up 20 to 30 percent of the subsoil. The available water holding capacity is 7 to 9 inches. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–1, forest management group 4.

Honeygrove clay, dissected uneven, 37 to 50 percent slopes (HoF).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it has steep, dissected slopes. This soil is about 6 feet deep. The available water holding capacity is 6 to 8 inches. Weathered pebbles and cobblestones make up 30 to 40 percent of the subsoil in places. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 4.

Honeygrove clay, ridge, 5 to 25 percent slopes (HrD).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it is gently sloping to steep and occupies long, narrow ridges. This soil is about 7 feet deep. In some places weathered pebbles make up 5 to 15 percent of the subsoil. Runoff is medium, and the hazard of erosion is moderate.

This soil is only fairly suitable for campgrounds because of very slow runoff, the windthrow hazard, and the ease of soil compaction. Capability unit IVe–1, forest management group 1.

Honeygrove clay, ridge, 25 to 37 percent slopes (HrE).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it has moderately steep to steep slopes and occupies narrow ridges. It is about 4 feet deep. In some places pebbles and cobblestones, most of them weathered, make up 20 to 40 percent of the subsoil. The available water holding capacity is 6 to 8 inches. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–1, forest management group 1.

Honeygrove clay, uneven, 5 to 25 percent slopes (HsD).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it is gently sloping to sloping. Runoff is medium, and the hazard of erosion is moderate.

This soil is of limited suitability for campgrounds because the surface layer is sticky when wet and is readily compacted. Capability unit IVe–1, forest management group 2.

Honeygrove clay, uneven, 37 to 50 percent slopes (HsF).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it has steep slopes. It is 5 to 10 feet deep. Weathered pebbles and cobblestones make up about 30 percent of the subsoil. Included in mapping were areas of soils having slopes of 50 to 60 percent. Runoff is rapid and the hazard of erosion is high. Capability unit VIe–5, forest management group 4.

Honeygrove clay, basalt substratum, 25 to 37 percent slopes (HtE).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it is underlain by weathered basalt bedrock at depths of 5 to 7 feet. In some places unweathered pebbles make up 15 percent of the surface layer and 15 to 30 percent of the subsoil. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIe–1, forest management group 1.

Honeygrove clay, basalt substratum, ridge, 0 to 25 percent slopes (HuD).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it is nearly level to sloping and occupies long, narrow ridges. It is underlain by weathered basalt bedrock at depths of 5 to 7 feet. Unweathered pebbles commonly make up 5 to 10 percent of the surface layer and 10 to 25 percent of the subsoil. Included in mapping were areas of Honeygrove soils having steeper slopes. Runoff is slow to medium, and the hazard of erosion is moderate.

If this soil is protected from soil compaction and erosion, it is suitable for campgrounds. A study of the bed-

rock is important in the planning of sewage drainfields. Capability unit IVe–1, forest management group 1.

Honeygrove clay, basalt substratum, uneven, 10 to 37 percent slopes (HvE).—This soil is similar to Honeygrove clay, uneven, 25 to 37 percent slopes, but it has sloping to moderately steep slopes and is underlain by basalt bedrock at depths of 8 to 13 feet. Runoff is medium to rapid, and the hazard of erosion is moderate.

If this soil is protected from compaction and erosion, it is suitable for campgrounds on the lesser slopes. The presence of bedrock should be considered in planning of sewage drainfields. Capability unit VIe–1, forest management group 1.

Honeygrove Series, Heavy Variant

The Honeygrove series, heavy variant, consists of well-drained, nearly level to moderately steep soils that formed in alluvial and colluvial materials derived from tuffaceous siltstone. These soils formed under Douglas-fir and hemlock having an understory of a vine maple—salal, an ocean spray—salal, or a salal plant community. Elevations range from 500 to 1,500 feet. The average annual precipitation is 60 to 80 inches, the average annual air temperature is about 50° F., and the frost-free period is about 200 days. Honeygrove, heavy variant, soils are associated with Honeygrove, Apt, Bohannon, Digger, and Hatchery soils.

In a representative profile, the surface layer is about 9 inches thick and consists of dark reddish-brown clay. The subsoil is about 27 inches thick. The upper part of the subsoil is dark reddish-brown clay, and the lower part is yellowish-red gravelly clay. The substratum is yellowish-red clay, about 14 inches thick, that is underlain by siltstone.

Honeygrove clay, heavy variant, 0 to 25 percent slopes (HwD).—This soil has nearly level to sloping, even slopes.

Representative profile, in the clear cut about 100 feet northwest of the clump of young Douglas-fir trees on northwest trending ridge in the NE¼NE¼ sec. 18, T. 14 S., R. 7 W.:

O1 & O2—1 inch to 0, partially decomposed Douglas-fir needles, twigs, and leaves from shrubs and brackenfern.

A1—0 to 2 inches, dark-brown (7.5YR 3/2) clay, dark brown (7.5YR 4/3) when dry; strong, very fine, granular structure, slightly hard, friable, sticky, plastic; many roots; many fine irregular pores; few (5 percent) shot-size concretions or rock fragments, strongly acid; abrupt, smooth boundary (2 to 4 inches thick)

A3—2 to 9 inches, dark reddish-brown (5YR 3/4) clay, reddish brown (5YR 4/4) when dry; strong, very fine, subangular blocky structure; slightly hard, friable, sticky, plastic; many roots; common fine interstitial pores; thin continuous dark coatings; very fine (1 percent) rock fragments or shot-size concretions; very strongly acid, clear, smooth boundary. (5 to 8 inches thick)

B21t—9 to 15 inches, dark reddish-brown (5YR 3/4) clay, yellowish red (5YR 4/6) when dry, strong, very fine, subangular blocky structure; hard, firm, sticky, very plasic; common roots; many fine tubular pores; thin nearly continuous clay films; (2 percent) rock fragments; very strongly acid; clear, smooth boundary. (5 to 8 inches thick)

B22t—15 to 22 inches, dark reddish-brown (5YR 3/4) clay, yellowish red (5YR 4/6) when dry; moderate to strong, very fine and fine, subangular blocky structure; hard, firm, sticky, very plastic; many fine pores; few roots; few fine tubular pores; thin to medium continuous clay films; very fine (1 percent) shot-size concretions or rock fragments; very strongly acid; clear, wavy boundary. (5 to 8 inches thick)

B3—22 to 36 inches, yellowish-red (5YR 4/6) gravelly clay, yellowish red (5YR 5/6) when dry; moderate, fine, subangular blocky structure; hard, friable, sticky, very plastic; few roots; many fine and very fine pores; common thin and medium clay films on ped surfaces and pores; very strongly acid; clear, wavy boundary. (12 to 18 inches thick)

C1—36 to 50 inches, yellowish-red (5YR 4/6) clay, yellowish red (5YR 5/6) when dry; massive, hard, friable, sticky, very plastic; very few roots; many fine and very fine tubular pores; (10 percent) weathered siltstone fragments; very strongly acid; clear, smooth boundary.

C2—50 to 55 inches, tuffaceous siltstone; very few widely spaced fractures with thin yellowish-red coatings along fracture walls

Depth to bedrock ranges from 40 to 100 inches. The B horizon has a clay content of 70 to 75 percent and is 10 to 30 percent pebbles, a few of which are basalt

This soil has moderately slow permeability. Runoff is medium, and the hazard of erosion is moderate. The available water holding capacity is 5 to 9 inches. Effective rooting depth is 40 to 100 inches.

Hunting is the main recreation use of this Honeygrove soil. Deer frequently browse the palatable brush growing in some areas, and grouse feed on salal berries. This soil is not suitable for campgrounds, because of the high hazard of windthrow, the moderate risk of erosion, and the stickiness of the surface layer when the soil is wet. Capability unit IVe–1, forest management group 1.

Honeygrove clay, heavy variant, uneven, 25 to 40 percent slopes (HyE).—This soil is similar to Honeygrove clay, heavy variant, 0 to 25 percent slopes, but it has moderately steep, uneven slopes. Runoff is rapid, and the hazard of erosion is high.

This soil is not suitable for campgrounds, because of slope and erosion. Capability unit VIe–1, forest management group 4.

Kilchis Series

The Kilchis series consists of well-drained, shallow, very steep to extremely steep soils that formed in alluvial and colluvial materials underlain by basalt. These soils formed under Douglas-fir and hemlock having an understory of grasses, a vine maple—salal or a swordfern plant community. Elevations range from 500 to 3,500 feet. The average annual precipitation is 80 to 120 inches. The average annual air temperature is about 49° F., and the frost-free period is about 180 days. Kilchis soils are associated with Hembre, Hatchery, Mulkey, Klickitat and Trask soils.

In a representative profile, the surface layer is dark reddish-brown cobbly loam about 6 inches thick. The subsoil is dark reddish-brown very cobbly loam about 7 inches thick. It is underlain by basalt at a depth of about 13 inches.

Kilchis rocky loam, 50 to 100 percent slopes (KcG).—This mapping unit consists of about 85 percent Kilchis cobbly loam, 50 to 100 percent slopes, about 10 percent rock outcrops, and 5 percent inclusions. It occurs in the mountains and has very steep to extremely steep slopes.

Representative profile of Kilchis cobbly loam, located along South Fork Road, about 35 feet north of the road, on the steep south slope, about 100 feet west of the sharp

corner in the county road, in center of SE¼NW¼NW¼ sec. 20, T. 14 S., R. 7 W., about 3 miles southeast of Alsea:

A1—0 to 6 inches, dark reddish-brown (5YR 2/2) cobbly loam, reddish brown (5YR 5/4) when dry; strong, very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many very fine and fine irregular pores; 40 percent coarse fragments; strongly acid; abrupt, wavy boundary. (4 to 8 inches thick)

B2—6 to 13 inches, dark reddish-brown (5YR 3/3) very cobbly loam, yellowish red (5YR 4/6) when dry; strong, very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common roots; many very fine tubular pores; 40 percent cobblestones and 30 percent pebbles; medium acid; abrupt, wavy boundary (6 to 12 inches thick)

IIR—13 inches, slightly fractured basalt.

Pebbles and cobblestones make up 25 to 40 percent of the A horizon. Depth to bedrock ranges from 12 to 20 inches.

Included in mapping were areas of soils on ridges having slopes of less than 20 percent, and areas of Hatchery and Klickitat soils.

The soil in this mapping unit has moderately rapid permeability. Runoff is very rapid, and the hazard of erosion is very high. The available water holding capacity is 1 to 2 inches. Effective rooting depth is 12 to 20 inches.

This mapping unit is used for timber production and water supply. Recreation use is limited to occasional hunting because of slope. Few big-game animals use the unit as a habitat because it is so steep. It is not suitable for campgrounds. Capability unit VIIs–1, forest management group 12.

Klickitat Series

The Klickitat series consists of well-drained, sloping to extremely steep, gravelly soils that formed in alluvial and colluvial materials derived from basalt. These soils formed under Douglas-fir and western hemlock having a dominant understory of a vine maple—salal or a vine maple—swordfern plant community. Elevations range from 500 to 4,000 feet. The average annual precipitation is 80 to 120 inches. The average annual air temperature is about 50° F., and the frost-free period is about 170 to 200 days. Klickitat soils are associated with Blachly, Hatchery, Hembre, Kilchis, Mulkey, and Marty soils.

In a representative profile, the surface layer is about 8 inches thick and consists of dark reddish-brown gravelly clay loam. The subsoil is dark reddish-brown very gravelly clay loam about 21 inches thick. The underlying layer is a dark-brown very gravelly loam about 18 inches thick. Fractured basalt is at a depth of about 47 inches.

Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes (KmG).—This soil has very steep to extremely steep, dissected slopes and is in the mountains.

Representative profile, at the cutbank of a spur logging road, about 125 feet west of the point where Marys Peak road passes through a deep cut in the ridge, near the center of the SE¼SE¼ sec. 33, T. 12 S., R. 7 W., about 7 miles north-northeast of Alsea:

O1—1 inch to 0, organic litter that is a loose mixture of leaves, fir needles, and twigs

A1—0 to 8 inches, dark reddish-brown (5YR 3/2) gravelly clay loam, reddish brown (5YR 4/3) when dry; strong, fine and very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; abundant roots; many fine irregular pores; 25 percent pebbles, strongly acid; clear, wavy boundary. (6 to 12 inches thick)

B21—8 to 15 inches, dark reddish-brown (5YR 3/3) very gravelly clay loam, reddish brown (5YR 4/4) when dry; moderate, fine, granular and subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common roots; common fine irregular pores; 65 percent pebbles; very strongly acid (pH 5.0): clear, wavy boundary. (5 to 10 inches thick)

B22—15 to 29 inches, dark reddish-brown (5YR 3/4) very gravelly clay loam, yellowish red (5YR 4/6) when dry; moderate and weak, very fine, subangular blocky structure, slightly hard, friable, slightly sticky, slightly plastic; common roots; common fine irregular pores, common very fine tubular pores; 50 percent pebbles, 20 percent cobblestones and stones; very strongly acid; abrupt, wavy boundary (10 to 18 inches thick)

C—29 to 47 inches, dark-brown (7.5YR 4/4) very gravelly loam, strong brown (7.5YR 5/6) when dry; massive; soft, very friable, nonsticky, slightly plastic; few roots; common very fine irregular pores; 40 percent pebbles, 30 percent cobblestones and stones; very strongly acid; gradual, wavy boundary. (15 to 20 inches thick)

IIR—47 inches, fractured basalt.

Basalt bedrock commonly is at a depth of 40 to 60 inches Pebbles and cobblestones make up 15 to 50 percent of the A horizon, and 35 to 70 percent of the B horizon. The content of pebbles and cobblestones generally increases with depth. In some places the profile is loam, gravelly loam or very gravelly loam.

Included with this soil in mapping were areas of Kilchis soils and some rock outcrops.

This soil has moderately rapid permeability. Runoff is very rapid, and the hazard of erosion is very high. The available water holding capacity is 2.5 to 5 inches. Effective rooting depth is 40 to 50 inches.

This Klickitat soil is used for timber production and water supply. Big-game animals and game birds are plentiful because of the availability of palatable brush and herbaceous plants. Birds also obtain gravel and grit from the soil. Hunting is the main recreation use, but this soil is not suitable for campgrounds, because of slope and the hazard of erosion. Capability unit VIIe–2, forest management group 11.

Klickitat loam, 10 to 35 percent slopes (KkE).—This soil is similar to Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes, but it has sloping to moderately steep, undissected slopes and contains less than 20 percent pebbles in the surface layer. Coarse fragments make up less than 50 percent of the subsoil. Bedrock is at a depth of 6 to 8 feet. The available water holding capacity is 6 to 8 inches. Runoff is medium, and the hazard of erosion is moderate.

The lesser slopes of this soil are suitable for campgrounds if compaction and erosion are minimized. Capability unit VIe–1, forest management group 7.

Klickitat gravelly clay loam, 25 to 37 percent slopes (KlE).—This soil is similar to Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes, but it has moderately steep, undissected slopes. In most places, this soil is 4 to 5 feet deep. Runoff is medium, and the hazard of erosion is moderate. Included in mapping were a few areas of

Marty soils. Capability unit VIe–2, forest management group 7.

Klickitat gravelly clay loam, 37 to 50 percent slopes (KlF).—This soil is similar to Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes, but it has steep, undissected slopes. Depth to bedrock is about 5 feet. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–5, forest management group 8.

Klickitat gravelly clay loam, 50 to 75 percent slopes (KlG).—This soil is similar to Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes, but it has very steep, undissected slopes. The depth of this soil increases to about 5 feet near the foot of slopes. Runoff is very rapid, and the hazard of erosion is very high. Included in mapping were areas of Kilchis soils and rock outcrops and a few areas of Blachly soils that have a basalt substratum. Also included were areas of Klickitat soils where slopes are as much as 100 percent. Capability unit VIIe–2, forest management group 11.

Klickitat gravelly clay loam, dissected, 25 to 37 percent slopes (KmE).—This soil is similar to Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes, but it has moderately steep slopes. Basalt bedrock is at a depth of about 5 feet. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping were areas of Mulkey and Marty soils, and a few areas of Kilchis soils and rock outcrops. Capability unit VIe–2, forest management group 9.

Klickitat gravelly clay loam, dissected, 37 to 50 percent slopes (KmF).—This soil is similar to Klickitat gravelly loam, dissected, 50 to 85 percent slopes, but it has steep to very steep slopes. Basalt bedrock is at a depth of about 40 inches. In many places the surface layer is gravelly loam. Runoff is rapid, and the hazard of erosion is high.

Included in mapping were areas of Blachly soils, basalt substratum, and Kilchis soils, as well as a few areas of Marty and Mulkey soils and rock outcrops. Also included were some areas of Klickitat soils having slopes of 60 percent. Capability unit VIe–5, forest management group 9.

Klickitat gravelly clay loam, ridge, 25 to 45 percent slopes (KnF).—This soil is similar to Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes, but it is moderately steep to steep and occupies long, narrow ridges. The surface layer is gravelly sandy loam in some places. Depth to the underlying basalt bedrock is 40 to 60 inches. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping were many areas of Blachly soils that have a basalt substratum, and a few rock outcrops. Capability unit VIe–2, forest management group 7.

Klickitat-Blachly complex, 25 to 50 percent slopes (KoF).—This soil complex consists of small areas of Blachly soils that are so closely intermingled with areas of Klickitat soils that mapping them separately is impractical. The complex is 35 percent Klickitat gravelly clay loam, 25 to 37 percent slopes, 35 percent Klickitat gravelly clay loam, 37 to 50 percent slopes, and 30 percent Blachly clay loam, basalt substratum, uneven, 25 to 37 percent slopes. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIe–2, forest management group 7.

Knappa Series

The Knappa series consists of well-drained, nearly level to moderately sloping soils that are on alluvial terraces. These soils formed under Douglas-fir, hemlock, and alder having an understory of a salal—swordfern plant community and grasses. Elevations range from 20 to 300 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is about 52° F., and the frost-free period is about 200 to 210 days. Knappa soils are associated with Alsea, Brenner, Chitwood, and Hebo soils.

In a representative profile, the surface layer is very dark brown and very dark grayish-brown silt loam about 9 inches thick. The subsoil is very dark grayish-brown and dark-brown silty clay loam about 29 inches thick. The underlying material is dark-brown silt loam about 22 inches thick.

Knappa silt loam, 0 to 3 percent slopes (KpA).—This nearly level soil is on terraces.

Representative profile, located in the first field southwest of Lobster Valley Road bridge over the South Fork Alsea River, 75 feet west of gate to field and 100 feet south of trees along South Fork Alsea River, in sec. 12, T. 14 S., R. 8 W.:

Ap1—0 to 6 inches, very dark brown (10YR 2/2) silt loam, brown (10YR 4/3) when dry; moderate, fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many fine irregular pores; extremely acid; gradual, smooth boundary. (4 to 8 inches thick)

Ap2—6 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam, brown (10YR 4/3) when dry; weak, fine, granular and subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many fine irregular pores; extremely acid; abrupt, smooth boundary. (3 to 5 inches thick)

B1—9 to 16 inches, very dark grayish-brown (10YR 3/2) silty clay loam, brown (10YR 4/3) when dry; moderate, fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common roots; few very fine tubular pores; extremely acid; gradual, smooth boundary. (4 to 9 inches thick)

B21—16 to 21 inches, very dark grayish-brown (10YR 3/2) silty clay loam, brown (10YR 4/3) when dry; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; common roots; common very fine tubular pores; thin darker colored coatings along root channels; 5 percent pebbles; very strongly acid; clear, smooth boundary (4 to 9 inches thick)

B22—21 to 25 inches, dark-brown (10YR 3/3) silty clay loam, brown (10YR 5/3) when dry; moderate, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; few roots; common very fine tubular pores; thin very dark brown (10YR 2/2) coatings on ped surfaces; 5 percent pebbles; very strongly acid; gradual, smooth boundary. (3 to 6 inches thick)

B3—25 to 38 inches, dark-brown (10YR 3/3) silty clay loam, brown (10YR 5/3) when dry; weak, fine, angular blocky structure; hard, friable, sticky, plastic; few roots; common fine and very fine tubular pores; 5 percent pebbles; thin very dark brown (10YR 2/2) coatings on ped surfaces; strongly acid; gradual, smooth boundary. (10 to 15 inches thick)

C—38 to 60 inches, dark-brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) when dry; few, fine, distinct, strong-brown (7 5YR 5/6) mottles; massive; hard, friable, slightly sticky, slightly plastic; few roots; common very fine tubular pores; common black stains: 10 percent fine pebbles at depth of 40 inches, increasing to about 20 percent coarse and fine pebbles at depth of 60 inches; strongly acid

In some places sandy and gravelly strata underlie the soil below a depth of 40 inches.

Included with this soil in mapping were areas of Alsea and Chitwood soils, and areas of soils that have a clay subsoil.

This soil has moderate permeability. Runoff is slow, and the hazard of erosion is slight. The available water holding capacity is 11 to 13 inches. Effective rooting depth is 60 inches or more.

Most areas of this Knappa soil have been cleared and are used for improved pasture and hay. The soil may be suited to seed orchards or nurseries. It is well suited to use for campgrounds. Some big-game animals use this soil as a habitat, and hunting is a recreation use. Capability unit IIc–1, not placed in a forest management group.

Knappa silt loam, 3 to 8 percent slopes (KpB).—This soil is similar to Knappa silt loam, 0 to 3 percent slopes, but it is gently sloping and is on terraces. In many places it is on the terrace escarpment. The surface layer is about 7 inches thick. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping were areas of Knappa silty clay loam and Nehalem soils. Also included were areas of soils that have a clay subsoil and areas of soils that have a thin, dark-colored surface layer. Capability unit IIe–1, not placed in a forest management group.

Knappa silty clay loam, 8 to 13 percent slopes (KsC).—This moderately sloping soil is similar to Knappa silt loam, 0 to 3 percent slopes, but it is moderately sloping, is on terraces and terrace escarpments, and has a finer textured surface layer. Runoff is rapid, and the hazard of erosion is moderate.

Included in mapping were areas of soils that have a finer textured subsoil than Knappa soils, and areas of soils that have clay loam, heavy loam, or silt loam subsoil. Capability unit IIIe–1, not placed in a forest management group.

Landslides-Apt Material

Landslides-Apt material (La) consists of areas of Apt soils that have been disturbed by mass movement. The areas of active movement are identified by trees that lean or have bowed trunks and by steep, uneven, hummocky microrelief. Seepy areas are common, and the soils are wet in most depressions. In some places these soils have an undisturbed profile, but in other places the soil material has been mixed to various degrees within a short distance. The depth to bedrock is about 10 to 15 feet. Runoff is variable, and the hazard of erosion is moderate, except along incised drainages where it is high.

This land type is used by wildlife because palatable brush and herbaceous plants are available. Hunting is the main recreation use. The areas are not suitable for campgrounds, because of unfavorable relief, the ease of compaction and subsequent erosion, and the hazard of windthrow. Capability unit VIe–1, forest management group 2.

Landslides-Slickrock Material

Landslides-Slickrock material (Ls) consists of areas of Slickrock soils that have been disturbed by mass movement. The areas of active movement are identified by steep, uneven, hummocky microrelief and by trees that lean or have bowed trunks. Soils are wet in most depressions, and seepy areas are common. These soils have an undisturbed profile in some places, but in others they have been mixed to various degrees. Bedrock is very deep. In some places the soils are less gravelly than typical Slickrock soils. Runoff is variable, and the hazard of erosion is moderate, except along incised drainages where it is high.

This land type is suitable for wildlife because of the availability of palatable brush and herbaceous plants that grow here. Hunting is the main recreation use, but the land is not suitable for campgrounds, because of unfavorable relief, risk of compaction and subsequent erosion, and the hazard of windthrow. Capability unit VIe–1, forest management group 2.

Lint Series

The Lint series consists of moderately well-drained, gently sloping to moderately steep soils that are on marine terraces. These soils formed under Sitka spruce, hemlock, or deciduous forest in which the understory is mainly of a salmonberry—swordfern plant community. Elevations range from 80 to 160 feet. The average annual precipitation is 60 to 70 inches, the average annual air temperature is about 51° F., and the frost-free period is about 225 days. Lint soils are associated with Depoe, Fendall, and Ferrelo soils.

In a representative profile, the surface layer is 20 inches thick and consists of very dark brown and dark-brown silty clay loam. The subsoil is dark-brown and light yellowish-brown silty clay loam about 25 inches thick. The underlying material is mottled light brownish-gray to strong-brown, dense silt loam that is 15 inches thick or more.

Lint silty clay loam, 3 to 25 percent slopes (LtD).—This soil is gently sloping to sloping and is on marine terraces.

Representative profile, located at the west cut bank of a private driveway in the NW¼SE¼SW¼NE¼ sec. 28, T. 13 S., R. 11 W., about 2 miles east of Waldport:

A1—0 to 11 inches, very dark brown (10YR 2/2) silty clay loam, dark brown (10YR 4/3) when dry; strong, very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many fine irregular pores; extremely acid; clear, wavy boundary. (8 to 12 inches thick)

A3—11 to 20 inches, dark-brown (10YR 3/3) silty clay loam, brown (10YR 4/3) when dry; moderate, very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; common roots; common very fine irregular pores; extremely acid; clear, wavy boundary (4 to 12 inches thick).

B2—20 to 28 inches, dark-brown (10YR 4/3) silty clay loam, very pale brown (10YR 7/3) when dry; moderate, fine, subangular blocky structure; hard, friable, slightly sticky, plastic; few roots; common fine irregular pores and common very fine tubular pores; thin, continuous, dark grayish-brown ped coatings; extremely acid; gradual, wavy boundary (6 to 12 inches thick)

B3—28 to 45 inches, light yellowish-brown (10YR 6/4) silty clay loam, very pale brown (10YR 7/4) when dry; few, fine, faint, yellowish-brown (10YR 5/8) and light brownish-gray (2.5Y 6/2) mottles; weak, coarse, subangular blocky structure; slightly hard, friable, sticky, plastic; few roots; few very fine tubular

pores; extremely acid; gradual, wavy boundary. (15 to 20 inches thick)

C—45 to 60 inches, mixed light brownish-gray (2.5Y 6/2), pale-brown (10YR 6/3), reddish-yellow (7.5YR 6/6), and strong-brown (7.5YR 4/6), dense silt loam, very pale brown (10YR 7/3) when dry; massive; hard, friable, slightly sticky, slightly plastic; very few roots; very few very fine tubular pores; extremely acid.

The A1 horizon is black in some places. Gravel and sand generally underlie this soil at a depth of about 10 feet.

Included with this soil in mapping were a few areas of somewhat poorly drained, darker-colored soils.

This soil has moderate permeability. Runoff is slow, and the hazard of erosion is slight to moderate. The available water holding capacity is 11 to 13 inches. Effective rooting depth is 60 inches or more.

This Lint soil is used for timber production and as nurseries for fuchsia, rhododendron, azalea, and other plants that require a cool, moist climate and an acid soil. It also is used for homesites because of the scenic view of Alsea Bay. The soil is suitable for campgrounds if it is protected from compaction and erosion. Its use as wildlife habitat is decreasing because of human occupation. Hunting is light because the soil is in areas close to homesites. Capability unit VIe–3, forest management group 5.

Lint silty clay loam, 25 to 37 percent slopes (LtE).—This soil is similar to Lint silty clay loam, 3 to 25 percent slopes, but it is moderately steep. It is on marine terraces and terrace escarpments. Runoff is medium, and the hazard of erosion is moderate. Included in mapping were areas of soils that have a texture of clay loam and contain 20 to 35 percent pebbles and cobblestones. Also included were many, small, wet areas.

This soil is not suitable for campgrounds, because of slope and the hazard of erosion. Capability unit VIe–3, forest management group 5.

Loamy Alluvial Land

Loamy alluvial land (Lu) consists of well-drained, stratified, loamy material that is underlain by stratified sand and gravel. This land formed in alluvium on flood plains along stream channels, but it is flooded only infrequently. Slopes are undulating and are less than 3 percent. Abandoned stream channels are common. Stratified sand and gravel are as shallow as 2 feet in some places. The vegetation generally is a mixture of various shrubs and herbaceous plants.

Included in mapping were areas of Sandy alluvial land and Nehalem soils.

Loamy alluvial land has moderately rapid permeability. The available water holding capacity is about 4 to 6 inches. The hazard of erosion is moderate.

Some areas make suitable sites for nurseries or seed orchards. The land is well suited to use for campgrounds if there is vegetative cover to control erosion. Sanitary facilities drain freely, and no supplemental drainage is needed. Capability unit IVw–1, not placed in a forest management group.

Marty Series

The Marty series consists of well-drained, nearly level to moderately steep soils that formed in alluvial and colluvial materials derived from coarse-grained basic igneous rocks on mountain slopes and ridges. Marty soils formed under Douglas-fir and alder, as well as some hemlock and noble fir at higher elevations. The understory plant community is vine maple—salal, ocean spray—salal, swordfern, or brackenfern—salal. Elevations range from 800 to 3,000 feet. The average annual precipitation is 80 to 120 inches. The average annual air temperature is about 49° F., and the frost-free period is about 150 to 190 days. Marty soils are associated with Blachly, Klickitat, and Slickrock soils.

In a representative profile, the surface layer is dark reddish-brown silty clay loam about 14 inches thick. The upper part of the subsoil is about 12 inches thick and is dark reddish-brown loam. The lower part of the subsoil is yellowish-red heavy loam and clay loam about 34 inches thick.

Marty silty clay loam, 0 to 25 percent slopes (MaD).—This level to sloping soil is in the mountains.

Representative profile, 1 mile north of Flat Mountain in the SW¼SE¼ sec. 13, T. 13 S., R. 7 W., in Benton County:

A11—0 to 5 inches, dark reddish-brown (5YR 3/2) silty clay loam, dark reddish brown (5YR 3/3) when dry; strong, fine, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; few coarse and many fine roots, many very fine irregular pores; 10 percent fine shot-size concretions and pebbles and 5 percent diorite cobblestones; very strongly acid; clear, smooth boundary. (4 to 7 inches thick)

A12—5 to 14 inches, dark reddish-brown (5YR 3/4) silty clay loam, reddish brown (5YR 4/4) when dry; strong, fine, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; few coarse and many very fine roots; many very fine irregular pores; 15 percent fine shot-size concretions and pebbles; very strongly acid; clear, smooth boundary. (7 to 11 inches thick)

IIB1—14 to 26 inches, dark reddish-brown (5YR 3/4) heavy loam, reddish brown (5YR 4/4) when dry; moderate, very fine, subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine and fine tubular pores; 5 percent pebbles; very strongly acid; abrupt, smooth boundary. (10 to 14 inches thick)

IIB21—26 to 39 inches, yellowish-red (5YR 4/6) heavy loam, yellowish red (5YR 5/6) when dry; moderate, fine, subangular blocky structure; slightly hard, friable, slightly sticky, plastic; common fine roots; many very fine and fine tubular pores; 10 percent diorite pebbles and 5 percent cobblestones; very strongly acid; clear, smooth boundary. (10 to 15 inches thick)

IIB22—39 to 60 inches, yellowish-red (5YR 4/6) clay loam, yellowish red (5YR 5/6) when dry; weak, fine and medium, subangular blocky structure; slightly hard, friable, sticky, plastic; few fine roots; many very fine and tubular pores; 10 percent diorite pebbles and 5 percent cobblestones; very strongly acid.

Content of coarse fragments ranges from a few to 25 percent throughout the soil. These fragments are weathered to some degree. Depth to bedrock is 60 inches or more.

Included with this soil in mapping were areas of Blachly, Klickitat, and Slickrock soils.

This soil has moderately slow permeability. Surface runoff is medium, and the hazard of erosion is moderate. The available water holding capacity is 9 to 12 inches. Effective rooting depth is 60 inches or more.

This Marty soil is used for timber production and water supply. It is suitable for campgrounds if it is protected from soil compaction. A few big-game animals

browse the limited cover of palatable brush and herbaceous plants in places where timber has been logged. Game birds obtain hard gravel for grit from this soil. Hunting, though limited, is the major recreational use. Capability unit VIe–1, forest management group 1.

Marty silty clay loam, 25 to 40 percent slopes (MaE).—This soil is similar to Marty silty clay loam, 0 to 25 percent slopes, but it is moderately steep. It occurs in the mountains. Pebbles and cobblestones make up 10 to 35 percent of the subsoil, and the depth to bedrock is about 6 feet. Runoff is rapid, and the hazard of erosion is moderate.

This soil is not suitable for campgrounds, because of slope and the hazard of erosion. Capability unit VIe–1, forest management group 1.

Marty silty clay loam, ridge, 10 to 30 percent slopes (MrD).—This soil is similar to Marty silty clay loam, 0 to 25 percent slopes, but it is sloping to moderately steep and is mainly on ridges. Small areas are on knolls and spurs. Pebbles and cobblestones make up as much as 25 percent of the subsoil. Runoff is medium, and the hazard of erosion is moderate.

This soil has limited suitability for campgrounds in the less sloping areas if it is protected from compaction. Capability unit VIe–1, forest management group 1.

Mulkey Series

The Mulkey series consists of well-drained, gently sloping to steep soils that formed in alluvial and colluvial materials derived mainly from basic igneous rocks but probably also from volcanic ash. These soils formed under grass and brackenfern. Elevations range from 3,000 to 4,100 feet. The average annual precipitation is 80 to 120 inches. The average annual air temperature is about 47° F., and the frost-free period is 120 to 150 days. Mulkey soils are associated with Bohannon, Kilchis, and Klickitat soils.

In a representative profile, the surface layer is black and very dark-brown loam and gravelly loam about 19 inches thick. The subsoil is dark-brown cobbly loam about 7 inches thick. Fractured diorite or gabbro underlies the soil at a depth of about 26 inches.

Mulkey loam, 5 to 25 percent slopes (MuD).—This soil is gently sloping to sloping and is in the mountains.

Representative profile, about 150 yards east of the Marys Peak campground in W½SW¼NE¼SW¼, sec. 21, T. 12 S., R. 7 W., in Benton County:

A11—0 to 10 inches, black (7.5YR 2/1) loam, very dark gray (7 5YR 3/1) when dry; moderate, very fine, granular structure; soft, very friable, slightly sticky, slightly plastic; many roots; many fine and very fine irregular pores; few cobblestones; extremely acid; gradual, smooth boundary. (6 to 13 inches thick)

A12—10 to 19 inches, very dark brown (7.5YR 2/3) gravelly loam, dark brown (7 5YR 3/2) when dry; moderate, very fine, granular structure; soft, very friable, slightly sticky, slightly plastic; common roots; many fine and very fine irregular and tubular pores; common pebbles and cobblestones, most larger than 2 inches; extremely acid; clear, smooth boundary. (8 to 12 inches thick)

B2—19 to 26 inches, dark-brown (10YR 3/3) cobbly loam, brown (10YR 4/3) when dry; moderate, fine, subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common very dark brown and black ped coatings; few roots; few fine irregular and very fine tubular pores; 30 percent cobblestones and stones, mostly larger than 4 inches; very strongly acid; abrupt, irregular boundary. (6 to 18 inches thick)

IIR—26 inches, fractured diorite or gabbro.

The depth to bedrock ranges from 20 to 40 inches. The content of coarse fragments may be as much as 15 percent in the A1 horizon and as much as 50 percent in the B2 horizon.

Included with this soil in mapping were a few small areas of Klickitat and Kilchis soils.

This soil has moderate permeability. Runoff is medium, and the hazard of erosion is moderate. The available water holding capacity is 3 to 6 inches. Effective rooting depth is 20 to 40 inches.

This Mulkey soil is used for recreation, grazing, forest protection lookouts, and communication stations. It is also used for campgrounds because of the high elevation and excellent scenic view. Brush for campsite screening is difficult to establish and maintain. To control erosion, a grass cover must be maintained. Some deer graze in areas of this soil during summer, but winter use is limited because of the accumulation of snow. Capability unit VIe–4, not placed in a forest management group.

Mulkey loam, 25 to 50 percent slopes (MuF).—This soil is similar to Mulkey loam, 5 to 25 percent slopes, but it has moderately steep to steep slopes. In most areas slopes are 25 to 40 percent. The surface layer, about 4 to 7 inches thick, is very dark brown and is 5 to 15 percent pebbles. Bedrock occurs at a depth of about 20 inches. There are a few rock outcrops. Runoff is rapid, and the hazard of erosion is high.

Included in mapping were small areas of Kilchis soils.

This soil is suitable for such recreational uses as hiking. It is not suitable for campgrounds, because of slope, or for fire lookout towers or communication stations, because of limited visibility. Capability unit VIe–4, not placed in a forest management group.

Nehalem Series

The Nehalem series consists of well-drained, nearly level soils that lie on flood plains and are subject to periodic overflow in winter and spring. These soils formed under coniferous forests but are now mostly cleared and seeded to pasture grasses. Elevations range from 10 to 600 feet. The average annual precipitation is 60 to 90 inches, the average annual air temperature is about 52° F., and the frost-free period is about 180 days. Nehalem soils are associated with Brenner, Clatsop, Knappa, and Nestucca soils.

In a representative profile, the surface layer, about 15 inches thick, is very dark grayish-brown silt loam. The subsoil is dark-brown silt loam about 15 inches thick. It is underlain by dark-brown silt loam and gravelly silt loam that extends to a depth of about 60 inches.

The surface layer of these soils in the Alsea Area is thicker than is within the defined range for the series, but this difference does not alter their use and behavior.

Nehalem silt loam (Ne).—This nearly level soil is on flood plains.

Representative profile, 750 feet west of a private driveway and 500 feet south of State Highway 34, near the middle of the south section line of sec. 21, T. 13 S., R. 7 W.:

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam, brown (10YR 5/3) when dry; moderate, fine,

granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many fine irregular pores; thin continuous coatings of very dark brown (10YR 2/2); very strongly acid, clear, smooth boundary. (3 to 8 inches thick)

A3—6 to 15 inches, very dark grayish-brown (10YR 3/2) silt loam, brown (10YR 5/3) when dry; moderate, very fine and fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; many very fine irregular pores, common thin coatings of very dark brown (10YR 2/2) very strongly acid; gradual, smooth boundary (6 to 12 inches thick)

B2—15 to 30 inches, dark-brown (10YR 3/3) silt loam, brown (10YR 5/3) when dry; weak and moderate, fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common roots; few very fine tubular pores; thin continuous coatings of very dark brown (10YR 2/2) along root channels, strongly acid; gradual, smooth boundary. (10 to 20 inches thick)

C1—30 to 45 inches, dark-brown (10YR 4/3) silt loam, yellowish brown (10YR 5/4) when dry; massive; slightly hard, friable, slightly sticky, plastic; few roots; few very fine tubular pores: very strongly acid; gradual, smooth boundary. (10 to 20 inches thick)

IIC2—45 to 60 inches, dark-brown (10YR 4/3) gravelly loam, brown (10YR 5/4) when dry; massive; slightly hard, friable, slightly sticky, plastic; few roots; few fine irregular pores, 20 percent fine and medium pebbles; very strongly acid.

In places the A horizon contains pebbles and thin strata of sand A few pebbles can occur throughout the profile The B horizon is heavy loam in some places Faint, gray and strong-brown mottles occur in the deeper profiles where this soil borders Brenner or Nestucca soils

Included with this soil in mapping were areas of Nestucca soils, Sandy alluvial land, and Loamy alluvial land.

This soil has moderate permeability. Surface runoff is slow, and the hazard of erosion is slight. The available water holding capacity is 10 to 12 inches. Effective rooting depth is 40 inches or more.

Most areas of this Nehalem soil have been cleared and are used for pasture and cultivated crops. The soil is well suited to use for campgrounds and generally is near a stream where it drains freely and does not erode readily. Fishing is the major recreation use. Big-game animals graze the available forage. Capability unit IIw–2, not placed in a forest management group.

Nestucca Series

The Nestucca series consists of somewhat poorly drained, nearly level to gently sloping soils on flood plains that have shallow swales and concave depressions. These soils formed under western hemlock, red alder, and Sitka spruce having an understory of shrubs, grasses, and skunk cabbage. Elevations range from 10 to 300 feet. The average annual precipitation is 60 to 100 inches, the average air temperature is about 52° F., and the frost-free period is about 180 days. Nestucca soils are associated with Brenner, Clatsop, Knappa, and Nehalem soils.

In a representative profile, the surface layer is about 7 inches thick and consists of dark-brown silt loam, containing a few pale-brown and yellowish-brown mottles. The subsoil is about 18 inches thick and is very dark grayish brown and dark-brown light silty clay loam that contains common to many, distinct, strong-brown mottles. The underlying material, to a depth of 40 inches, is mottled grayish-brown and dark-brown light silty clay loam.

Nestucca silt loam, 0 to 3 percent slopes (NsA).—This nearly level soil is on flood plains.

Representative profile, 500 feet south of a private driveway and 150 feet west of Lobster Valley Road near middle of south section line of sec. 12, T. 14 S., R. 8 W.:

Ap—0 to 7 inches, dark-brown (10YR 3/3) silt loam, brown (10YR 5/3) when dry; few, fine, faint, pale-brown (10YR 6/3) and yellowish-brown (10YR 5/4) mottles along small root channels; moderate, fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic, many roots; common very fine tubular pores and common fine irregular pores; extremely acid; clear, smooth boundary. (5 to 10 inches thick)

B21—7 to 15 inches, very dark grayish-brown (2.5Y 3/2) light silty clay loam, brown (10YR 5/3) when dry; common, fine, distinct, strong-brown (7 5YR 5/6) mottles; weak, fine, subangular blocky structure. slightly hard, friable, slightly sticky, plastic; common roots, many very fine tubular pores; very strongly acid; gradual, smooth boundary (5 to 10 inches thick)

B22—15 to 25 inches, dark-brown (10YR 4/3) light silty clay loam, very pale brown (10YR 6/3) when dry; many, fine. distinct, strong-brown (7 5YR 5/6) mottles; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky, plastic; few roots; many very fine tubular pores and common fine tubular pores; common coatings of dark grayish brown (2 5Y 4/2); very strongly acid; gradual, smooth boundary. (5 to 15 inches thick)

Cg—25 to 40 inches, mixed grayish-brown (2 5Y 5/2) and dark-brown (10YR 4/3) light silty clay loam; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; slightly hard, friable, slightly sticky, plastic; few roots; common fine and very fine pores; very strongly acid

In some places the Ap horizon is not mottled In places the C horizon is heavy loam, silt loam, or clay loam and has thin lenses of sand and gravel.

Included with this soil in mapping were areas of Brenner and Nehalem soils.

This soil has moderate permeability. Surface runoff is very slow to ponded, and the hazard of erosion is slight. The available water holding capacity is 11 to 13 inches. Effective rooting depth ordinarily is 40 inches or more, but for water-sensitive crops, the rooting depth may be limited by the seasonal water table.

This Nestucca soil is used for pasture and forage crops. It is not well suited to growing timber or to use for campgrounds. This soil drains slowly, and water may stand on it during winter. Some big-game animals graze the available forage. Capability unit IIw–2, not placed in a forest management group.

Nestucca silt loam, 3 to 8 percent slopes (NsB).—This soil is similar to Nestucca silt loam, 0 to 3 percent slopes, but it is gently sloping. The surface layer normally is free of mottles. This soil generally is not subject to flooding by streams. Runoff is slow, and the hazard of erosion is slight.

Included in mapping were areas of Nehalem soils. Capability unit IIIw–2, not placed in a forest management group.

Preacher Series

The Preacher series consists of well-drained, nearly level to steep soils that formed in alluvial and colluvial

materials derived from sandstone on ridges and smooth side slopes in the mountains. These soils formed under Douglas-fir and hemlock. A vine maple—swordfern or a salal—swordfern plant community is dominant in the understory. Elevations range from 250 to 2,500 feet. The average annual precipitation is 80 to 120 inches, the average annual air temperature is 49° F., and the frost-free period is about 170 days. Preacher soils are associated with Bohannon, Blachly, Slickrock, and Trask soils.

In a representative profile, the surface layer is very dark brown and dark-brown clay loam about 14 inches thick. The subsoil is dark yellowish-brown clay loam about 28 inches thick. Pebbles make up about 10 percent of this layer. The underlying material is yellowish-brown sandy loam about 18 inches thick. Weathered sandstone is at a depth of about 60 inches.

Preacher clay loam, ridge, 0 to 25 percent slopes (PrD).—This nearly level to sloping soil is on ridges.

Representative profile, on a ridge 150 feet south of the road in the north half of NW¼NW¼SW¼ sec. 24, T. 15 S., R. 10 W., about 11 miles south of Tidewater in Lane County:

A1—0 to 6 inches, very dark brown (10YR 2/2) clay loam, brown (10YR 4/3) when dry; moderate, fine and very fine, granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine irregular pores; few concretions or rock fragments (5 percent); abundant roots, very strongly acid; gradual, smooth boundary. (4 to 8 inches thick)

A3—6 to 14 inches, dark-brown (10YR 3/3) clay loam, brown (7.5YR 4/4) when dry; moderate, fine, granular structure and weak, very fine, subangular blocky structure; slightly hard, friable, sticky, slightly plastic; many fine irregular pores; few coarse fragments or concretions; many roots; very strongly acid, clear, smooth boundary. (5 to 10 inches thick)

B21—14 to 28 inches, dark yellowish-brown (10YR 3/4) clay loam, brown (7.5YR 4/4) when dry; weak, medium, subangular blocky structure parting to moderate, very fine, subangular blocky structure; slightly hard, friable, sticky, slightly plastic; few very fine irregular pores; many very fine tubular pores; about 10 percent small coarse fragments; very few, thin, slightly darker colored ped coatings; many roots; very strongly acid; gradual, smooth boundary. (10 to 16 inches thick)

B22—28 to 42 inches, dark yellowish-brown (10YR 3/4) clay loam, dark yellowish brown (10YR 4/4) when dry; weak, medium, subangular blocky structure parting to moderate, fine and very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine tubular pores; about 10 percent small coarse fragments; very few, thin, darker colored ped coatings, common to few roots; very strongly acid; clear, smooth boundary (10 to 16 inches thick)

IIC—42 to 60 inches, yellowish-brown (10YR 5/4) sandy loam, very pale brown (10YR 7/4) when dry; massive; slightly hard, friable, slightly sticky, slightly plastic; many very fine tubular pores; about 15 percent small firm coarse fragments; few roots; very strongly acid; abrupt, irregular boundary. (10 to 22 inches thick)

R—60 to 70 inches, weathered Tyee sandstone

The color of the A1 and A3 horizons ranges to very dark grayish brown, and the texture ranges to loam Content of coarse fragments generally is less than 20 percent throughout the profile Most of the deeper, less gravelly areas of this soil are on broad, flat ridges Depth to sandstone bedrock ranges from 40 to 72 inches

Included with this soil in mapping were areas of Bohannon and Slickrock soils and a few rock outcrops.

This soil has moderate permeability. Surface runoff is medium, and the hazard of erosion is moderate. The available water holding capacity is 6.5 to 12 inches. Effective rooting depth is 40 to 72 inches.

This Preacher soil is used for timber production and water supply. Although windthrow is a hazard, this soil is suitable for campgrounds if it is protected from compaction. Big-game animals graze the limited supply of palatable brush and herbaceous plants in areas that have been clear harvested. Hunting is the main recreation use. Capability unit VIe–1, forest management group 5.

Preacher clay loam, 0 to 25 percent slopes (PhD).—This soil is similar to Preacher clay loam, ridge, 0 to 25 percent slopes, but it is in mountains instead of on ridges. This soil is in irregularly shaped areas. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping were areas of Blachly and Slickrock soils. Windthrow is not a hazard for campgrounds on this soil. Capability unit VIe–1, forest management group 5.

Preacher clay loam, 25 to 37 percent slopes (PhE).—This soil is similar to Preacher clay loam, ridge, 0 to 25 percent slopes, but it is moderately steep and on mountains instead of ridges. Pebbles make up 15 percent of the subsoil in most places. This soil is in irregularly shaped areas. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping were areas of Preacher soils and many areas of Bohannon soils having slopes as steep as 50 percent.

This soil is not suitable for campgrounds, because of slope. Capability unit VIe–1, forest management group 5.

Preacher clay loam, dissected, 25 to 45 percent slopes (PlF).—This soil is similar to Preacher clay loam, ridge, 0 to 25 percent slopes, but it has moderately steep to steep, dissected slopes. This soil is in irregularly shaped areas. Pebbles make up about 15 percent of the subsoil in most places, but on the steeper slopes, the content of cobblestones and pebbles in the subsoil may be as much as 30 percent. Bedrock generally is at a depth of about 4 feet. Runoff is rapid, and the hazard of erosion is high. Included in mapping were areas of Bohannon soils along the incised drainages.

This soil is not suitable for campgrounds, because of slope and terrain. Capability unit VIe–1, forest management group 3.

Preacher clay loam, ridge, 25 to 37 percent slopes (PrE).—This soil is similar to Preacher clay loam, ridge, 0 to 25 percent slopes, but it is moderately steep. This soil is about 4 feet deep. Pebbles make up about 25 percent of the subsoil. Runoff is medium, and the hazard of erosion is moderate. Included in mapping were areas of Bohannon soils.

This soil is not suitable for campgrounds, because of slope, but it can serve as a location for fire lookouts where the adjacent relief is favorable. Capability unit VIe–1, forest management group 5.

Sandy Alluvial Land

Sandy alluvial land (Sa) consists of nearly level, somewhat poorly drained, stratified, sandy and gravelly alluvial materials near the stream channel on flood plains. The vegetation is mainly a mixture of shrubs and her-

baceous plants. Abandoned stream channels are common. These areas are frequently flooded. Slopes are less than 3 percent, and the surface is gently undulating. The surface layer is sandy loam or gravelly sandy loam that is generally about 6 inches thick and is underlain by stratified sand and gravel. In places the underlying sand and gravel are as shallow as 3 inches.

Included in mapping were areas of Loamy alluvial land.

Permeability is rapid, and there is a permanent water table at a depth of 2 to 4 feet. The hazard of erosion is moderate. The available water holding capacity is only 1 to 3 inches, and the soil materials tend to be droughty for shallow-rooted plants.

This land type is used mostly for grazing. In a few places it is used for campgrounds, which must be protected from flooding. Capability unit IVw-1, not placed in a forest management group.

Skinner Series

The Skinner series consists of well-drained, gently sloping to very steep soils that formed in colluvium over residuum derived from basalt. These soils formed under Douglas-fir and hemlock having an understory of the salal—swordfern plant community. Elevations range from 300 to 1,800 feet. The average annual precipitation is 60 to 100 inches, the average annual air temperature is about 50° F., and the frost-free period is about 225 days. Skinner soils are associated with Desolation and Fendall soils.

In a representative profile, the surface layer is about 13 inches thick and consists of dark-brown, very dark brown, and black gravelly clay loam. The subsoil is brown gravelly or cobbly clay loam about 16 inches thick. The underlying material is dark yellowish-brown very cobbly light clay. Basalt is at a depth of about 45 inches.

Skinner gravelly clay loam, dissected, 25 to 50 percent slopes (SkF).—This soil is moderately steep to steep and is in the mountains.

Representative profile, located at a rounded corner in the USFS road in the southwest corner of NW¼NW¼NE¼ sec. 9, T. 14 S., R. 11 W., about 5 miles southeast of Waldport, Lincoln County:

A1—0 to 5 inches, mixed very dark brown and black (10YR 2/3, 2/1) gravelly clay loam, very dark grayish brown (10YR 3/2) when dry; strong, very fine, granular structure; soft, friable, slightly sticky, slightly plastic; many roots; many very fine irregular pores; 20 percent pebbles and cobblestones; very strongly acid; clear, smooth boundary. (4 to 7 inches thick)

A3—5 to 13 inches, dark-brown (7.5YR 3/4) gravelly clay loam, brown (7.5YR 5/4) when dry, moderate, very fine, granular structure; soft, friable, slightly sticky, slightly plastic; many roots; many very fine tubular pores; 20 percent pebbles and cobblestones; extremely acid; gradual, smooth boundary (6 to 10 inches thick)

B1—13 to 22 inches, brown (7.5YR 4/4) gravelly clay loam, yellowish brown (10YR 5/4) when dry; weak, very fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; common very fine tubular pores; 20 percent pebbles and cobblestones; extremely acid; gradual, smooth boundary. (7 to 10 inches thick)

B2—22 to 29 inches, brown (10YR 4/3) cobbly clay loam, yellowish brown (10YR 5/4) when dry; weak, very fine, subangular blocky structure; slightly hard, friable, sticky, slightly plastic; common roots; common very fine tubular pores; 25 percent pebbles and cobblestones; extremely acid; gradual, smooth boundary. (6 to 10 inches thick)

IIC—29 to 45 inches, dark yellowish-brown (10YR 4/4) very cobbly light clay, yellowish brown (10YR 5/4) when dry; massive; slightly hard, friable, sticky, plastic; few roots; common very fine tubular pores; few thin clay films in pores; 50 percent coarse fragments; very strongly acid; abrupt, irregular boundary. (15 to 25 inches thick)

IIR—45 inches, basalt.

The combined thickness of the A and B horizons commonly ranges from 24 to 36 inches Depth to basalt ranges from 40 to 60 inches Coarse fragments make up 15 to 25 percent of the A horizon and as much as 35 percent of the B2 horizon. These fragments generally make up 35 percent of the B3 and C horizons and as much as 65 percent of the volume below a depth of 40 inches

Included with this soil in mapping were some areas of Desolation, Fendall, and Hembre soils.

This soil has moderately slow permeability. Surface runoff is rapid, and the hazard of erosion is high. The available water holding capacity is 6 to 8 inches. Effective rooting depth is 40 to 60 inches or more.

This Skinner soil is used for timber production and water supply. Big-game animals graze the palatable brush and herbaceous plants in the clear-harvested areas. Birds also are common. The main recreation use is hunting, but this soil is not suitable for campgrounds, because of slope. Capability unit VIe-3, forest management group 9.

Skinner gravelly clay loam, 5 to 37 percent slopes (SgE).—This soil is similar to Skinner gravelly clay loam, dissected, 25 to 50 percent slopes, but it is gently sloping to moderately steep. Bedrock is at a depth of about 5 feet. Runoff is slow, and the hazard of erosion is slight.

This soil is suitable for campgrounds if the surface layer is protected from compaction and if erosion is controlled. Capability unit VIe-3, forest management group 7.

Skinner gravelly clay loam, 37 to 50 percent slopes (SgF).—This soil is similar to Skinner gravelly clay loam, dissected, 25 to 50 percent slopes, but it has steep, undissected slopes. Runoff is medium, and the hazard of erosion is high. Capability unit VIe-3, forest management group 8.

Skinner gravelly clay loam, 50 to 75 percent slopes (SgG).—This soil is similar to Skinner gravelly clay loam, dissected, 25 to 50 percent slopes, but it has very steep, undissected slopes. There are a few rock outcrops. Runoff is rapid, and the hazard of erosion is very high. Capability unit VIIe-1, forest management group 11.

Skinner-Desolation complex, 10 to 37 percent slopes (S'E).—This complex consists of small areas of Desolation soils that are so closely intermingled with areas of Skinner soils that mapping them separately is impractical. The complex is about 60 percent Skinner gravelly clay loam, 5 to 37 percent slopes, and about 40 percent Desolation clay loam, 10 to 35 percent slopes. The Skinner soils are about 5 feet deep and, in most places, have slopes of 25 to 37 percent. Rock outcrops are not common. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIe-3, forest management group 7.

Skinner-Desolation complex, dissected, 25 to 50 percent slopes (SnF).—In this complex small areas of Desolation soils are so closely intermingled with areas of Skinner soils that mapping them separately is impractical. The complex is about 70 percent Skinner gravelly clay loam, dissected, 25 to 50 percent slopes and about 30 percent Desolation clay loam, 10 to 35 percent slopes. The Skinner soils are about 5 feet deep. Runoff is rapid, and the hazard of erosion is high. Capability unit VIe–3, forest management group 9.

Slickrock Series

The Slickrock series consists of well-drained, nearly level to very steep soils that formed in alluvial and colluvial materials derived from sandstone. These soils formed under Douglas-fir, hemlock, and western red cedar having an understory of a vine maple—swordfern or a salmonberry—swordfern plant community. Elevations range from 250 to 2,500 feet. The average annual precipitation is 80 to 120 inches. The average annual air temperature is about 49° F., and the frost-free period is about 170 days. Slickrock soils are associated with Blachly, Bohannon, Marty, Preacher, and Trask soils.

In a representative profile, the surface layer is very dark brown gravelly loam about 7 inches thick. The upper part of the subsoil is very dark brown and dark-brown gravelly clay loam about 16 inches thick. The lower part of the subsoil is dark-brown and dark yellowish-brown cobbly and very cobbly clay loam about 32 inches thick. Slightly weathered sandstone bedrock is at a depth of about 55 inches.

Slickrock gravelly loam, 25 to 37 percent slopes (SsE).—This soil is moderately steep and is in the mountains.

Representative profile, about 150 feet east of USFS road 1492, from a point where an abandoned "pioneer" cat spur leaves the road in an easterly direction, in the W½SW¼NW¼NE¼ sec. 4, T. 15 S., R. 9 W., about 4½ miles southeast of the junction of Five Rivers Creek and the Alsea River in Lane County:

A1—0 to 3 inches, very dark brown (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) when dry; moderate, very fine, granular structure; soft, friable, slightly sticky, slightly plastic; many roots; many very fine irregular pores; 40 percent gravel-size rock fragments or concretions or both, in the upper part of this horizon; very strongly acid; clear, smooth boundary. (3 to 7 inches thick)

A3—3 to 7 inches, very dark brown (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) when dry; moderate, very fine, granular and very fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; many roots; common very fine irregular pores; few very fine tubular pores; 20 percent pebbles; very strongly acid; clear, smooth boundary. (3 to 6 inches thick)

B21—7 to 14 inches, very dark brown and dark-brown (10YR 2/2, 3/3) gravelly clay loam, dark grayish brown and dark brown (10YR 4/2, 4/3) when dry; moderate, very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine tubular pores; common roots; very strongly acid; clear, smooth boundary. (5 to 10 inches thick)

B22—14 to 23 inches, dark-brown (10YR 3/3) gravelly clay loam, brown (10YR 5/3) when dry; moderate, fine and very fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few roots; common very fine tubular pores; thin, slightly darker colored ped coatings; very strongly acid; clear, smooth boundary. (6 to 14 inches thick)

B31—23 to 47 inches, dark-brown (10YR 3/3) cobbly clay loam, brown (10YR 5/3) when dry; moderate, medium, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few roots; common very fine pores; thin discontinuous ped coatings; about 35 percent coarse fragments; few filled root channels; very strongly acid; clear, smooth boundary. (20 to 25 inches thick)

B32—47 to 55 inches, dark yellowish-brown (10YR 4/4) very cobbly clay loam, light yellowish brown (10YR 6/4) when dry; weak, medium, subangular blocky structure; slightly hard, friable, sticky, plastic; few roots; common very fine pores; few thin coatings on some ped surfaces; about 50 percent coarse fragments; very strongly acid; clear, irregular boundary. (6 to 10 inches thick)

IIC—55 to 60 inches, yellowish-brown, slightly weathered, tuffaceous sandstone.

Depth to bedrock ranges from 4 feet to more than 10 feet. Coarse fragments make up more than 20 percent of the soil profile, and their content generally increases with depth The texture of the A horizon ranges from gravelly loam to gravelly clay loam If present, the C horizon is loam, clay loam, or sandy loam and generally is more than 50 percent coarse fragments.

Included with this soil in mapping were areas of Blachly, Bohannon, and Preacher soils.

This soil has moderate permeability. Surface runoff is slow, and the hazard of erosion is moderate. The available water holding capacity is 6 to 10 inches. Effective rooting depth is 48 inches or more.

This Slickrock soil is used for timber production and water supply. Big-game animals browse the palatable brush and herbaceous plants in areas that have been clear harvested. Hunting is the main recreational use, but the soil is not suitable for campgrounds, because of slope. Capability unit VIe–1, forest management group 2.

Slickrock loam, 10 to 25 percent slopes (SoD).—This soil is similar to Slickrock gravelly loam, 25 to 37 percent slopes, but it is gently sloping to sloping. Coarse fragments make up less than 20 percent of the surface layer. Runoff is slow, and the hazard of erosion is slight. Included in mapping were some small areas of Blachly, Bohannon, and Preacher soils. This soil is fairly suitable for campgrounds if compaction of the surface layer is minimized. Capability unit VIe–1, forest management group 2.

Slickrock loam, dissected, 10 to 25 percent slopes (SrD).—This soil is similar to Slickrock gravelly loam, 25 to 37 percent slopes, but it has gently sloping to sloping, dissected slopes. Coarse fragments make up less than 20 percent of the surface layer. Runoff is slow, and the hazard of erosion is slight.

Included in mapping were areas of sloping Blachly soils and areas of Bohannon soils along some of the incised drainageways.

This soil is fairly suitable for campgrounds if compaction of the surface layer is minimized. Capability unit VIe–1, forest management group 4.

Slickrock gravelly loam, 0 to 25 percent slopes (SsD).—This soil is similar to Slickrock gravelly loam, 25 to 37 percent slopes, but it is nearly level to sloping. The depth to sandstone bedrock may be 5 to 15 feet. Runoff is slow, and the hazard of erosion is slight. Soil materials at the base of headwalls above benchland are very un-

stable (fig. 6). Included in mapping were areas of Blachly and Bohannon soils. This soil is suitable for campgrounds if its surface is protected from compaction. Capability unit VIe–1, forest management group 2.

Slickrock gravelly loam, 37 to 50 percent slopes (SsF).—This soil is similar to Slickrock gravelly loam, 25 to 37 percent slopes, but it has steep slopes. Small wet spots are common in depressional areas of this soil. Runoff is rapid, and the hazard of erosion is high.

Included in mapping were some areas of Bohannon and Preacher soils. Capability unit VIe–5, forest management group 4.

Slickrock gravelly loam, dissected, 25 to 37 percent slopes (StE).—This soil is similar to Slickrock gravelly loam, 25 to 37 percent slopes, but it has dissected slopes. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping were areas of sloping Blachly soils and areas of Bohannon soils along the drainageways. Capability unit VIe–1, forest management group 4.

Slickrock gravelly loam, dissected, 37 to 50 percent slopes (StF).—This soil is similar to Slickrock gravelly loam, 25 to 37 percent slopes, but it has steep, dissected slopes. Runoff is rapid, and the hazard of erosion is high.

Included in mapping were areas of Bohannon soils and sandstone rock outcrops along the incised drainages. Capability unit VIe–5, forest management group 4.

Slickrock gravelly loam, seeped, 10 to 35 percent slopes (SuE).—This soil is similar to Slickrock gravelly loam, 25 to 37 percent slopes, but it is sloping to moderately steep and is wet throughout the year. Seeps and springs are common. Runoff is slow, and the hazard of erosion is slight to moderate.

Included in mapping were areas of Bohannon and Preacher soils. Capability unit VIe–1, forest management group 2.

Figure 6.—Typical area of a Slickrock soil on benchland.

Tidal Marsh

Tidal marsh (Tm) consists of nearly level, barren areas of clayey sediment that is subject to tidal overflow. The soil material is fine textured and structureless to a depth of 60 inches or more. A few salt- and water-tolerant plants grow in some places. Areas of Tidal marsh are used for recreation. Capability unit VIIIw–1; not placed in a forest management group.

Trask Series

The Trask series consists of shallow, well-drained, very steep and extremely steep soils that formed in alluvial and colluvial materials derived from sandstone. These soils formed under Douglas-fir having an understory plant community of vine maple—salal or vine maple—swordfern. Elevations range from 500 to 2,500 feet. The average annual precipitation is 80 to 100 inches, the average annual air temperature is about 48° F., and the frost-free period is about 140 days. Trask soils are associated with Apt, Astoria, Blachly, Bohannon, Kilchis, Preacher, and Slickrock soils.

In a representative profile, the surface layer is very dark grayish-brown gravelly loam about 6 inches thick. The subsoil is dark-brown very gravelly loam that is also about 6 inches thick. Fractured sandstone bedrock is at a depth of about 12 inches.

Trask gravelly loam, 50 to 100 percent slopes (TrG).—This very steep to extremely steep soil is on mountains.

Representative profile, located on the north side of a logging skidroad where this road crosses the spur ridge in the SE¼SW¼ sec. 24, T. 13 S., R. 9 W., in Lincoln County:

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) gravelly loam, grayish brown (10YR 5/2) when dry; moderate to strong, fine, granular structure; soft, friable, slightly sticky, slightly plastic; 20 to 30 percent pebbles; many roots; numerous fine irregular pores; very strongly acid; gradual, wavy boundary. (4 to 6 inches thick)

B2—6 to 12 inches, dark-brown (10YR 3/3) very gravelly loam, brown (10YR 5/3) dry; weak, medium, granular structure; slightly hard, friable, slightly sticky, slightly plastic; 50 percent sandstone pebbles; common roots; many very fine irregular pores; very strongly acid; abrupt, irregular boundary. (6 to 18 inches thick)

IIC—12 to 18 inches, unweathered, fractured Tyee sandstone with soil material in the fractures

Gravel or cobblestones make up from 35 to 75 percent of the soil profile Depth to bedrock ranges from 12 to 20 inches The texture of the B horizon ranges from loam to clay loam.

Included with this soil in mapping were areas of Bohannon soils, and soils similar to Trask soils that are 20 to 30 inches deep over sandstone. Also included were many rock outcrops.

This soil has moderately rapid permeability. Surface runoff is very rapid, and the hazard of erosion is very high. The available water holding capacity is 1 to 3.5 inches. Effective rooting depth is 12 to 20 inches.

This Trask soil is used for timber production and water supply. It is not suitable for campgrounds, because of slope. Other recreation uses are limited because of slope. Big-game animals use areas of this soil infrequently because browse and cover are limited. Capability unit VIIs–1, forest management group 12.

Use and Management of the Soils

This section briefly describes the system of capability classification used by the Soil Conservation Service and discusses the management of the soils by capability groups. Also discussed in this section is the suitability of the soils for forest land and for use in engineering.

Additional, detailed information on management of the soils on the floor of valleys can be obtained from local offices of the Extension Service, the Soil Conservation Service, or the Oregon Agricultural Experiment Station at Corvallis, Oregon.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

Capability Classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use (None in the Alsea Area.)

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife. (None in the Alsea Area.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c* shows that the chief limitation is climate that is too cold, too dry, or too cloudy.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-1. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units[4]

In the pages that follow, the capability units in the Alsea Area are described and suggestions for use and management for all the soils of each unit are given. The names of soil series represented are mentioned in the description of each capability unit, but this does not mean that all soils of a given series appear in the unit. The names of all soils in any given capability unit, can be found by referring to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT IIe-1

The only soil in this capability unit is Knappa silt loam, 3 to 8 percent slopes. This soil is gently sloping or undulating and is on valley terraces. It is more than 60 inches deep, has moderate permeability, and is well drained. The available water holding capacity is high. The hazard of erosion is moderate.

This soil can be used for cultivated crops, pasture, selected forest types, wildlife, and limited recreation. All climatically adapted crops are likely to grow well. These include row and field crops, nursery and greenhouse crops, and stands of legumes and grasses for pasture, hay,

[4] By C. C. Bowlsby, Soil Conservation Service, Portland, Oregon

and silage. A suitable cropping system is one in which close-growing crops are grown for about one-half the time in each rotation period. This soil presently is used less intensively than its capability.

A good stand of high-quality grasses and legumes can be established and maintained with applications of lime, nitrogen, and phosphorus, along with irrigation. Potassium also may be needed. Winter cover crops are needed to protect the soil during prolonged wet periods. Fall pasture seedings should be made early enough to insure winter cover. Cross-slope tillage helps to protect the exposed soil from erosion. In a few places, diversion terraces and sodded waterways are needed to protect the soil from surface runoff from adjacent uplands.

Successfully managing this soil for pasture includes proper seedbed preparation, rotation grazing, harrowing, clipping, weed control, and irrigation. To avoid soil compaction that retards pasture growth in spring, livestock should be kept off this soil in winter when the grass is dormant. Only a very small acreage of this soil presently is irrigated.

CAPABILITY UNIT IIw–1

The only soil in this capability unit is Alsea loam, 0 to 3 percent slopes. This moderately well drained soil is on terraces and is more than 60 inches deep. Permeability is moderate, and the available water holding capacity is high. Runoff is slow, and the hazard of erosion is slight.

The use of this soil is limited by wetness that can be corrected by improving drainage. The water table is highest in winter and early in spring. Under natural conditions, this soil can be used for most cultivated crops, pasture, selected forest types, and wildlife. Because of wetness, however, the soil is cold late in spring and early in fall. After it has drained, climatically adapted crops are likely to do well.

Grasses and legumes may succeed without drainage. However, adequate drainage permits the use of higher producing, deeper rooted grasses and legumes and allows earlier and later growth. Drainage generally can be accomplished by a single interceptor drain that prevents water from adjacent uplands from entering the soil.

After the soil is adequately drained, a good stand of high-quality grasses and legumes can be established and maintained with moderate applications of lime, nitrogen, and phosphorus. Potassium also may be needed. Supplemental irrigation is generally needed after fertilization.

Irrigation water generally is not readily available for this soil. If water is available, sprinkler irrigation is well suited.

CAPABILITY UNIT IIw–2

This capability unit consists of soils of the Nehalem and Nestucca series. These soils are nearly level and are on flood plains. They have a surface that is smooth and gently undulating. They are moderately well drained to poorly drained and are more than 60 inches deep. Permeability is moderately slow, the available water capacity high, and the hazard of erosion is slight. These soils are subject to flooding, and the Nestucca soils are excessively wet.

Wetness and flooding limit the use of the soils in this unit, and careful management is needed Other hazards are few, however, and the necessary management is easy to apply. These soils can be used for selected cultivated crops, pasture, selected forest types, and wildlife. Before drainage is improved, climatically adapted crops will do well if they are resistant to long periods of wetness and need only a restricted zone of rooting. After the soils are adequately drained, all climatically adapted crops are likely to grow well.

Adequate drainage permits the use of higher producing, deeper rooted grasses and legumes and also makes possible earlier and later growth. A good stand of high-quality grasses and legumes can be established and maintained with applications of lime, phosphorus, and nitrogen. Successful management of pasture includes proper seedbed preparation, rotation grazing, harrowing, clipping, and weed control. Livestock should be kept off the soils during periods of prolonged wetness to avoid soil compaction and retarded growth of pasture plants in spring.

Minor land leveling and graded, shallow waterways are sufficient to improve surface drainage. Tile drains will lower the water table and promote subsurface drainage.

Irrigation is seldom needed except late in summer or early in fall after a prolonged dry period. Irrigation may depend on the availability of sufficient water from shallow wells or streams.

In winter, frequent short-period overflow is a constant hazard, and adequate winter cover is necessary to control erosion during periods of overwash. Levees may be required to protect these soils from floods.

CAPABILITY UNIT IIw–3

The only soil in this capability unit is Chitwood silt loam, 0 to 3 percent slopes. This soil is on valley terraces and is somewhat poorly drained to moderately well drained. It is more than 60 inches deep. Permeability is slow, the available water holding capacity is high, and the hazard of erosion is slight.

Wetness limits the use of this soil, but the wetness can be reduced by providing adequate drainage. The soil can be used for selected cultivated crops, pasture, selected forest types, and wildlife. Before drainage is improved, climatically adapted crops will do well if they are resistant to long periods of wetness and need only a somewhat restricted zone of rooting. After the soil is adequately drained, all climatically adapted crops are likely to grow well. Many areas of this soil are presently unimproved. Grasses and legumes are fairly productive without drainage. Adequate drainage permits the use of higher producing grasses and legumes and allows earlier and later growth.

Drainage generally can be accomplished by a single interceptor and tile drain or by open ditch. Additional laterals may be needed.

After the soil is adequately drained, a good stand of high-quality grasses and legumes can be established and maintained with applications of lime, nitrogen, and phosphorus. Supplemental irrigation is needed in most years.

Successfully managing this soil for pasture includes proper seedbed preparation, rotation grazing, harrowing, clipping, and weed control. To avoid compaction that retards pasture growth in the spring, livestock should be kept off this soil when the grass is dormant and during prolonged wet periods. Where water for irrigation is available, pasture growth can be greatly increased by use of sprinklers.

CAPABILITY UNIT IIc-1

The only soil in this capability unit is Knappa silt loam, 0 to 3 percent slopes. An excessive cloud cover, more than 50 percent of the time from April through September, restricts the maturing of some crops, thus limiting crop selection. This nearly level soil is on terraces and is more than 60 inches deep. It has moderate permeability and is well drained. The available water holding capacity is high, and the hazard of erosion is slight.

This soil is suitable for cultivated crops, pasture, selected forest types, wildlife, or recreation. Climatically adapted crops, except those requiring a large amount of sunshine, will do well on this soil. These include row and field crops, specialty crops including nursery and greenhouse crops, and grasses and legumes for pasture, hay, and silage. A suitable cropping system is one that includes close-growing crops about one-fourth of the rotation period. This soil presently is used less intensively than its potential

A good stand of high-quality grasses and legumes can be established and maintained with applications of lime, phosphorus, and nitrogen, particularly if the soil is irrigated in midsummer and early in fall.

Successfully managing this soil for pasture includes proper seedbed preparation, rotation grazing, harrowing, clipping, weed control, and irrigation. Most areas can be irrigated with water pumped from shallow wells or with gravity water from adjacent rivers and other streams. Irrigation is needed in midsummer and early in fall. Future irrigation may depend on the availability of water. Farm ponds can help to make more water available in some places.

CAPABILITY UNIT IIIe-1

The only soil in this capability unit is Knappa silty clay loam, 8 to 13 percent slopes. This soil is on fans. Its surface commonly is irregular because old channels, slump ridges, and depressions break the smooth overall contours of the slope. This well-drained soil is more than 60 inches deep and contains gravel layers in places. Permeability is moderate, the available water holding capacity is high, and the hazard of erosion is moderate.

This soil has only a few limitations, but these are severe and very careful management is required. The soil can be used for cultivated crops, pasture, selected forest types, wildlife, and recreation. Most climatically suited crops do well on this soil. Among these crops are field crops and legume-grass stands for pasture, hay, and silage. A suitable cropping system is one that includes close-growing crops for about three fourths of the rotation period.

A good stand of high-quality grasses and legumes can be established and maintained with applications of lime, phosphorus, and nitrogen. Supplemental irrigation is necessary to sustain a high level of productivity.

In managing this soil a winter cover crop is important for protection during prolonged wet periods. Cross-slope tillage is needed to prevent erosion when the soil is exposed. Pasture seedings should be made early enough in fall to provide winter cover. To protect the soil during periods of surface runoff, crop residue should be worked into the surface layer. Green-manure crops should be plowed under periodically to help maintain soil tilth and organic matter.

Successfully managing this soil for pasture includes proper seedbed preparation, rotation grazing, harrowing, clipping, and weed control. To avoid soil compaction that retards forage growth in spring, livestock should not be allowed to graze in winter.

Where water is available for irrigation, it should be applied through sprinklers.

CAPABILITY UNIT IIIw-1

This capability unit consists of gently sloping to moderately sloping soils of the Alsea and Chitwood series. These soils are on valley terraces and are deep and moderately well drained. Permeability is moderate to moderately slow, and the available water holding capacity is high. The hazard of erosion is slight to moderate, trafficability is fair, and the soils are easily compacted when wet. The organic-matter content is medium.

Wetness and slope permanently limit the use of these soils, but wetness can be reduced by drainage. These soils can be used for many kinds of cultivated crops, pasture, selected forest types, recreation, and wildlife. The soils are cold late in spring and early in fall because of the high water table. Adequate protection from wetness is essential before the full potential of these soils can be obtained. Most climatically adapted crops do well after drainage is improved.

Good production from grasses and legumes can be obtained without drainage, but improved drainage permits the use of higher producing, deeper rooted grasses and legumes. Adequate protection against wetness generally can be accomplished by a single interceptor drain to prevent water from adjacent uplands from entering the soil.

If properly protected from wetness, a good stand of high-quality grasses and legumes can be established and maintained with applications of lime, nitrogen, and phosphorus. Potassium also may be needed. After fertilization, supplemental irrigation generally is needed for maximum production. Where water is available, a sprinkler system is a suitable method of irrigation.

A winter cover crop is needed to protect these soils during prolonged wet periods. Cross-slope tillage is necessary to control erosion when the soil is exposed. Fall seedings should be made early enough to provide winter cover. All crop residue should be worked into the surface layer soil to protect the soil during periods of surface runoff. Green-manure crops should be plowed under periodically to help maintain the organic-matter content and good tilth.

CAPABILITY UNIT IIIw-2

The only soil in this capability unit is Nestucca silt loam, 3 to 8 percent slopes. This soil is gently sloping and is on flood plains adjacent to terraces. It is somewhat poorly drained and is more than 60 inches deep. Permeability is moderately slow, and the available water holding capacity is high. The hazard of erosion is slight. A high water table is present much of the year.

Wetness limits the use of this soil, but this can be corrected by drainage. Slope may also be a limitation if the soil is irrigated. Under natural conditions, this soil can be used for selected cultivated crops, pasture, selected forest types, and wildlife. After improvement, it can be

used for cultivated crops, pasture, woodland, and wildlife. Before the soil is drained, climatically adapted crops will do well if they are resistant to long periods of wetness and need only a restricted zone of rooting. After the soil is adequately drained, most climatically adapted crops are likely to grow well.

Adequate drainage permits the use of higher producing, deeper rooted grasses and legumes and makes possible earlier and later growth. A good stand of high-quality grasses and legumes can be established and maintained with applications of lime, phosphorus, and nitrogen. Successfully managing this soil for pasture includes proper seedbed preparation, rotation grazing, harrowing, clipping, and weed control. To avoid soil compaction that retards spring pasture growth, livestock should be kept off the soil during periods of prolonged wetness.

Minor land leveling and graded, shallow waterways are sufficient to improve surface drainage. Subsurface drainage to lower the water table may be accomplished by using tile drains.

CAPABILITY UNIT IIIw-3

The only soil in this capability unit is Brenner silt loam. This soil has smooth, nearly level slopes. It is in depressional areas on flood plains and is poorly drained. It is more than 60 inches deep. Permeability is slow, surface runoff is slow, and the soil is subject to annual ponding. A high water table contributes to wetness during much of the year. The available water holding capacity is high, and the hazard of erosion is slight.

Wetness severely limits the use of this soil. The choice of crops is restricted, and careful management is required. Flooding is a frequent hazard, even if drainage is improved. Most areas of this soil presently are unimproved. Under natural conditions, cultivation is not feasible, but potentially the soil can be used for pasture or wildlife. After it is drained, climatically adapted crops likely will do well if they are close growing, need only a restricted zone of rooting, and can survive frequent ponding.

Adequate drainage is essential in the management of this soil. To improve surface drainage, minor land leveling and graded, shallow waterways are sufficient. If subsurface drainage is to lower the level of water table, tile drains are essential. Careful installation is needed for narrow spacing, proper filter incasement, and proper depth of installation. Special effort is necessary to provide the drainage system with a suitable outlet. Occasionally, it is necessary to pump drainage water at the point of outlet.

After the soil is drained, productive grasses and legumes can be established and maintained with applications of lime, nitrogen, and phosphorus. Potassium also may be needed. During long dry periods, when irrigation commonly is needed, the water should be applied through sprinklers.

Successfully managing this soil for pasture includes proper seedbed preparation, rotation grazing, harrowing, clipping, and weed control. To avoid compaction that retards pasture growth in spring, livestock should be kept off this soil when the grass is dormant and during prolonged wet periods. In winter, adequate cover is needed to help control erosion.

CAPABILITY UNIT IVe-1

This capability unit consists of nearly level to sloping soils of the Apt and Honeygrove series. These soils are well drained, fine textured, and 60 inches deep or more. The available water holding capacity is high. Permeability is moderately slow, runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are used mainly for forestry, wildlife, and limited recreation. A few small areas are used for pasture. High precipitation and unfavorable slopes make these soils poorly suited to cultivated crops.

Where these soils have been cleared, they can be used for grass-legume pasture. Mixtures of improved legumes and grasses can be seeded, and lime, nitrogen, and phosphorus applied.

To control erosion, it is necessary to plant late in summer so that a cover of vegetation will protect the soils during the rainy season. All operations should be across the slope. Rotation grazing, weed control, clipping, and harrowing will help maintain yields. To avoid compaction that retards spring growth, livestock should be kept off the soil during periods of prolonged wetness.

CAPABILITY UNIT IVw-1

This capability unit consists of Loamy alluvial land and Sandy alluvial land.

These land types are nearly level to gently sloping and are on flood plains adjacent to streams. The surface layer commonly is irregular and is dissected by old stream channels. The soil materials are more than 60 inches deep and are somewhat poorly drained to well drained. Permeability is moderate and rapid, the available water holding capacity is very low to moderate, and the hazard of erosion is moderate.

On these land types, limitations are few but severe and very careful management is required. Overflow is an annual hazard in winter on Sandy alluvial land and a periodic hazard on Loamy alluvial land. These areas can be used for cultivated crops, pasture, limited forest types, wildlife, and recreation. Most climatically adapted crops do moderately well. Among these crops are field crops and grass-legume mixtures for pasture, hay, and silage. A suitable cropping system is one that includes close-growing crops for about three-fourths of the rotation period.

A good stand of high-quality legumes and grasses can be established and maintained with applications of lime, phosphorus, and nitrogen. Potassium also may be needed. Irrigation is necessary, and water generally is readily available from adjacent rivers and streams.

Successfully managing these soils for pasture includes seedbed preparation, rotation grazing, harrowing, clipping, and weed control. Pasture seedings should be made in spring after high water. To prevent erosion, a winter cover crop is essential.

CAPABILITY UNIT IVw-2

The only soil in this capability unit is Hebo silty clay loam. This soil is nearly level and is in depressions on terraces adjacent to uplands and foot slopes. The soil is poorly drained and has very slow permeability. The available water holding capacity is moderate, and the hazard of erosion is slight.

Wetness and very slow permeability severely limit the use of this soil. The choice of crops is restricted, and very careful management is required. Under natural conditions, cultivation is not feasible, but potentially the soil can be used for short-season pasture or for wildlife. After it is drained, climatically adapted crops do well if they have a shallow rooting system and are tolerant of long periods of excessive wetness. Most areas of this soil are unimproved.

In managing this soil, adequate drainage is essential. Drainage can be improved by interception drains adjacent to the higher lying soils or by open ditches that remove surface water. Land shaping may be necessary to fill in slightly depressional areas. Subsurface water can be removed by closely placed tile drains.

After the soil is drained, it requires applications of lime and of nitrogen and phosphorus fertilizers. Potassium may also be needed. Proper drainage and cultivation to establish a seeding of grasses and legumes early in fall will provide a winter cover that protects the soil during long wet periods. Cross-slope tillage is necessary to control erosion when the soil is exposed.

Successfully managing this soil for pasture consists of proper seedbed preparation, rotation grazing, harrowing, clipping, and weed control. To avoid compaction of the soil that retards pasture growth in spring, livestock should not be allowed to graze in winter.

CAPABILITY UNIT VIe–1

This capability unit consists of rolling soils of the Apt, Blachly, Hembre, Honeygrove, Klickitat, Marty, Preacher, and Slickrock series.

These soils are on uplands and have slopes that are mostly less than 37 percent. They are nearly level to steep, are medium textured to moderately fine textured in the surface layer and subsoil, and are well drained. The soils are deep to very deep. The available water holding capacity is moderate to very high. These soils have a subsoil that is moderately to moderately slowly permeable. Surface runoff is mostly medium to rapid. The hazard of erosion mostly is moderate but ranges from slight to high, and trafficability is fair to poor.

Also included in this capability unit is the land type, Colluvial and Alluvial land, which occupies long, narrow, winding areas along minor tributary valleys. Although low lying areas of Alluvial land are subject to periodic flooding, use and management of this land type are similar to those of the soils in this unit.

Other land types in this capability unit are Landslides-Apt material and Landslides-Slickrock material.

Relief, slope, location, high precipitation, and undesirable soil characteristics together are severe limitations that affect the use of soils in this unit. The soils are suitable only for forestry, wildlife, recreation, or limited pasture. Landslides are frequent in some areas. Trees grow well on these soils, which generally are used for woodland. Attempts to convert the soils to other uses may not be feasible or practical.

On uplands, however, where these soils occupy cleared areas adjacent to cultivated fields, grass-legume mixtures may provide low-producing pasture. Seedbed preparation generally is possible, and improved legumes and grasses can be established and maintained with moderate to large amounts of lime and fertilizer. To control soil damage, it is necessary to plant late in summer so that good vegetative growth will protect the soil during the rainy season.

Successfully managing these soils for pasture must include cross-slope operations, rotation grazing, and weed control. Where possible, clipping and harrowing are good practices to use for maintaining a healthy pasture. To prevent compaction that retards plant growth in spring, livestock should be kept off these soils during periods of prolonged wetness.

Soils of this unit make suitable habitat for large upland game animals.

CAPABILITY UNIT VIe–2

This capability unit consists of rolling soils of the Apt, Blachly, Bohannon, Digger, Hatchery, Honeygrove, Klickitat, and Slickrock series. These soils are on uplands and have slopes that are mostly less than 37 percent. They are gently sloping to steep, well drained, and 20 to more than 60 inches deep. They have a medium to moderately fine texture, and generally are gravelly or cobbly. The available water holding capacity is mostly moderate to very low, but it ranges to high where bedrock is at a depth of more than 40 inches. Permeability is moderate to moderately rapid, surface runoff is medium to rapid, and the hazard of erosion is mainly moderate.

Relief, slope, location, stones and gravel, high precipitation, and undesirable soil characteristics together severely limit the use of these soils. The soils are suitable only for limited pasture, forestry, wildlife, and limited recreation. The natural tree cover does well on these soils. Attempts to convert the soils to other uses generally are not feasible or practical.

If carefully managed, however, suitable grasses and legumes provide low-producing pasture in areas where the soils occupy uplands adjacent to cultivated fields and have been cleared of trees and brush or have open-grown trees. In many places, there are too many pebbles or cobblestones to permit preparation of a good seedbed.

If it is possible to prepare a seedbed, large amounts of lime and fertilizers must be used to establish and maintain a healthy stand. The legumes and grasses must be planted early enough to ensure a thick foliage before the rainy season. All operations should be across the slope and as nearly on the contour as possible. Rotation grazing and weed control are essential, and where the terrain permits, clipping and harrowing are helpful. To avoid grazing that may compact the soil and thereby retard plant growth in spring, livestock should be kept off these soils during periods of prolonged wetness.

Soils of this capability unit make suitable habitat for upland game animals.

CAPABILITY UNIT VIe–3

This capability unit consists of soils of the Astoria, Desolation, Fendall, Ferrelo, Lint, and Skinner series These soils are nearly level to steep and have slopes that are mostly less than 37 percent. They are well drained to moderately well drained and are 20 to more than 60 inches deep. Except for the Ferrelo soil, these soils have a moderately fine textured or fine textured subsoil. They are moderately or moderately slowly permeable, and their available water holding capacity is low to high. The Ferrelo soil has a medium-textured surface layer and a

moderately coarse textured subsoil. It has moderately rapid permeability.

The soils in this capability unit are so severely limited that they are suited mostly to forestry, wildlife, recreation, or water supply. If carefully managed, however, pasture consisting of close-growing legumes and grasses can be grown. Successfully managing the soils for pasture must include careful rotation of grazing and use of large amounts of commercial fertilizers.

Soils of this unit have a good potential as habitat for large game animals.

CAPABILITY UNIT VIe–4

This capability unit consists of gently sloping to steep soils of the Mulkey series. These soils are on mountains in open areas vegetated by ferns and grasses. Typically, the soils are on south- and east-facing slopes on the summit of Marys Peak and on other high peaks in the Alsea Area. These soils are well drained, 20 to 40 inches deep, and medium textured. Permeability is moderately rapid, and the available water holding capacity is low. Surface runoff is medium, and the hazard of erosion is moderate.

Cold climate and undesirable soil characteristics are permanent and severe limitations that restrict the use of these soils. The soils are suitable only for limited pasture, wildlife, water supply, and recreational use.

In managing these soils for pasture, care must be taken in the rotation of grazing and the distribution of livestock in order to maintain a healthy vegetative cover. Before winter, at least 10 inches of stubble should be maintained on the grass. Grazing by large game animals should be controlled to the number of animal-unit-months of grazing that are available.

CAPABILITY UNIT VIe–5

This capability unit consists of moderately steep to steep soils in the Apt, Blachly, Bohannon, Digger, Hatchery, Honeygrove, Klickitat, and Slickrock soils. These soils have slopes that are mostly between 37 and 50 percent. They are well drained and are medium to fine in texture. They are more than 20 inches deep, and they may be gravelly and cobbly. The available water holding capacity is low to high. Permeability is moderately rapid to moderately slow. Surface runoff is rapid, and the hazard of erosion is high.

Relief and slope are permanent and severe limitations to the use of these soils. The soils are suitable only for forestry, water supply, recreation, and wildlife. They are currently used for forestry and wildlife and are not suitable to convert to other uses.

Under proper management, these soils make suitable habitat for big-game animals.

CAPABILITY UNIT VIw–1

The only soil in this capability unit is Clatsop silty clay loam. This soil is above normal high tide and is subject to flooding only when the tide is abnormally high. It is nearly level, very poorly drained, and more than 60 inches deep. This soil has an organic surface layer. Permeability is moderately slow. Owing to surface evaporation of the brackish water table, the soil becomes salt affected in summer. Surface runoff is ponded, and the hazard of erosion is only slight.

Wetness and salinity are severe limitations to the use of this soil. The soil is unsuitable for cultivation. Under natural conditions, its use is restricted to pasture, recreation, and wildlife.

If management were unusually intensive, this soil could be made suitable for adapted crops that are shallow rooted and are tolerant of excessive wetness for long periods. Such practices would include use of dikes, drainage by pumping, tide gates, leaching of salts, regulation of the water table, and sufficient additions of chemical amendments and fertilizers. Drainage and tillage may permit oxidation of sulfides. This condition would cause the soil to become extremely acid. Drainage may also result in subsidence of the organic layer. Nearly all areas of this soil are in their natural condition.

CAPABILITY UNIT VIw–2

The only soil in this capability unit is Depoe silt loam. This soil is nearly level and is in slight depressions on marine terraces. It is a poorly drained soil that has an iron-indurated hardpan at a depth of less than 24 inches. The available water holding capacity is low. Permeability is moderate in the subsoil above the hardpan. Surface runoff is very slow or ponded. The hazard of soil blowing is moderate.

Shallow depth and unfavorable textures severely limit the use of this soil and make it unsuitable for cultivation. Under natural conditions, only forest products are grown. The soil is so inextensive, so isolated, and of such limited suitability for other purposes, that converting it to uses other than forestry generally is not feasible or practical. However, under intensive management this soil can be used for certain specialty crops, such as cranberries or blueberries. This management includes drainage to regulate the water table, ripping to break the hardpan, and applying lime and commercial fertilizers. Presently, all areas of this soil are in their natural condition.

CAPABILITY UNIT VIIe–1

This capability unit consists of soils in the Fendall and Skinner series. These soils have very steep slopes of 50 to 75 percent. They are well drained soils that are more than 20 inches deep. They have a moderately fine textured, gravelly surface layer and a fine textured subsoil. Permeability is moderately slow, and the available water holding capacity is low to moderate. Surface runoff is rapid, and the hazard of erosion is very high.

Slope severely limits these soils and restricts their use to forestry, water supply, and wildlife. Forest is the natural cover on these soils, and conversion to other uses is not feasible or practical. Many big-game animals use these areas.

CAPABILITY UNIT VIIe–2

This capability unit consists of soils in the Bohannon, Digger, Hatchery, Klickitat, and Slickrock series. These soils are very steep to extremely steep and have slopes ranging from 50 to 90 percent. They are well drained and are more than 20 inches deep. They are medium-textured and moderately fine textured, gravelly and cobbly soils. Permeability is moderately rapid. The available water holding capacity is chiefly low to moderate but may be high where the soils are more than 40 inches deep. Surface runoff is very rapid, and the hazard of erosion is very high.

Soil texture and slope severely limit the use of these soils. They are restricted to timber production, which is the most intensive use possible. Forest is the natural cover and should be maintained or re-established on these soils.

CAPABILITY UNIT VIIs-1

This capability unit consists of soils in the Bohannon, Kilchis, and Trask series. These soils have very steep to extremely steep slopes of 50 to 100 percent. They are 12 to 40 inches deep and are cobbly and gravelly and medium textured. Permeability is moderately rapid. The available water holding capacity is very low or low. Surface runoff is very rapid, and the hazard of erosion is very high.

The soils in this capability unit are severely limited for commercial plant production. Their use is restricted to limited timber harvest, limited recreation, wildlife, water supply, or esthetic purposes.

CAPABILITY UNIT VIIIw-1

In this capability unit is Tidal marsh, a miscellaneous land type that is around Alsea Bay, from near Waldport to the mouth of Drift Creek. It consists of fine-textured sediment that is more than 60 inches deep and is covered daily by brackish water. It contains an excess of soluble salts and generally is saturated with salt water.

Location, texture, and salinity limit the use of this land for commercial plant production. Its use is restricted to recreation and limited wildlife use by waterfowl and molluscoid animals.

CAPABILITY UNIT VIIIs-1

In this capability unit is Dune land, a miscellaneous land type made up of dunes and beaches along the ocean. It consists of fine to medium sand that is more than 60 inches deep.

Dune land has limitations that preclude its use for commercial plant production and restrict its use to recreation, water supply, and limited wildlife. Although these areas have no value for farming, they are very valuable for recreation. On the beach above tidal action, the wind frequently causes the sand to shift. Soil blowing can be controlled by an intensive planting program. To establish a cover, cross-wind plantings of beachgrass followed by plantings of Scotch-broom and shore pine are suitable. Both American and European beachgrasses have been used for this purpose.

Forest Management Groups

To assist managers of forest land in planning the use of their land for timber production, the soils in the Alsea Area have been placed in forest management groups. Each group consists of soils that have similar growth rates for Douglas-fir and have similar hazards and limitations affecting the use and management of forest land. Growth factors and management problems are discussed for each group.

Site class is a relative measure of a soil's wood-producing ability. Under this system the highest producing soil is designated as in site class 1, and the lowest, as in site class 5. Soils in classes 2, 3, and 4 have intermediate wood-producing capacity. The grouping of soils into site classes is based on the average total height of the dominant and codominant trees in the stand at the age of 100 years. These are the larger trees whose crowns form the general level of the forest canopy and, in a few places, extend above it.

Dominant and codominant trees growing in a well-stocked stand on soils of site class 1 will reach a height of 186 feet or more at the age of 100 years; those soils of site class 2 will reach a height of 155 to 185 feet; those on soils of site class 3, a height of 125 to 155 feet; those on soils of site class 4, a height of 95 to 125 feet; and those on soils of site class 5, a height of less than 95 feet (*8*).

Five factors that affect suitability of a site for wood products are related to the soils. These factors are the hazard of erosion, the hazard of windthrow, planting success, plant competition, and equipment limitations. These factors are discussed for the soils in each forest management group.

Erosion hazard is the degree of potential soil erosion. A slight hazard indicates that erosion control is not a significant problem. A moderate hazard indicates that some attention must be given to prevent erosion. A high hazard indicates that intensive treatment, specialized equipment, and methods of operation must be planned to minimize soil erosion.

Windthrow hazard is the danger of trees being blown over by wind. The hazard is low if trees are not expected to be blown down in commonly occurring winds. It is medium if some trees are expected to be blown down during periods of soil wetness and where the wind velocity is moderate or high. The hazard is high if many trees are expected to be blown down during periods of soil wetness and where the wind velocity is moderate or high.

Planting success refers to the survival of planted seedlings, as influenced by soil conditions when plant competition is assumed not to be a limiting factor. Success is good if no more than 25 percent of the seedlings die because of unfavorable soil conditions. It is fair if 25 to 50 percent of the seedlings die. Success is poor if more than 50 percent of the seedlings die.

Plant competition refers to the invasion and rate of growth of undesirable plants on a soil when openings are made in the forest canopy. A slight limitation indicates that plant competition will not prevent adequate natural regeneration and early growth of trees, nor will it interfere with adequate development of planted seedlings. A moderate limitation indicates that plant competition will delay natural or artificial tree regeneration, both establishment and growth rate, but that it will not prevent the eventual development of fully stocked normal stands. A severe limitation indicates that plant competition will prevent adequate natural or artificial tree regeneration without intensive site preparation and maintenance such as weeding.

Equipment limitations refer to those soil characteristics that restrict the use of logging equipment so that damage to the soils or trees will be prevented. Limitations are rated slight, moderate, or severe, according to the degree to which soil characteristics, such as slope, stoniness, and texture, influence the kind of equipment or the time of year the equipment can be used readily. The limitation is slight if the kind of equipment is not restricted, but the wet-season use of equipment is slightly restricted.

It is moderate if slopes are steep but stable, or if slopes are gentle to steep but soils are stony enough to interfere with equipment use, or if soils are plastic and unstable when wet. The limitation is severe if many types of equipment cannot be used because of very steep slopes, or if equipment use is limited seasonally by very wet soils.

The forest management groups in the Alsea Area are discussed in the following pages. The names of soil series represented are mentioned in the description of each forest group, but this does not mean that all the soils in a given series are in the group. To find the names of all the soils in any given forest management group, refer to the "Guide to Mapping Units" at the back of this soil survey. A few soils that have little or no potential for timber production have not been placed in a forest group, but the management needed on these soils is discussed in the subsection "Management by Capability Units."

FOREST MANAGEMENT GROUP 1

This group consists of nearly level to steep soils in the Blachly, Honeygrove, and Marty series and the Honeygrove series, heavy variant. These soils are more than 50 inches deep. They are on mountain ridges and have slopes that generally are less than 37 percent. The soils are well drained. The hazard of erosion generally is slight to moderate, but on Blachly clay loam, 37 to 50 percent slopes, and Honeygrove clay, 37 to 50 percent slopes, the hazard of erosion is high.

Most of the soils in this group are in timber site class 2 for Douglas-fir. On Honeygrove soils, the timber site class is either high 3 or low 2. For the Honeygrove soil, heavy variant, it is 3 and the planting success is fair. The hazard of windthrow is mostly medium to low.

Planting success generally is good, and replants are rarely needed. Competition from brush and alder is only slight to moderate, and extensive control measures are not required.

The terrain is smooth so that most forest management activities, such as spraying, planting, and thinning, can be carried out easily. Yarded logs generally do not gouge deep skid trails.

Equipment limitations are severe. Tractors and trucks cause compaction of these soils, except for a period of about two months in summer. During the wet period, operation of such equipment should be restricted. Unless a road is built, the two soils having slopes of 37 to 50 percent are too steep for the safe operation of tractors.

FOREST MANAGEMENT GROUP 2

This group consists of nearly level to moderately steep soils in the Apt, Blachly, Desolation, Honeygrove, and Slickrock series, as well as the land types, Landslides-Apt material and Landslides-Slickrock material. These soils are in the mountains. They are similar in most respects to soils in group 1.

The timber site class for Douglas-fir is mostly 2. On Honeygrove soils, it is either high 3 or low 2. The hazard of windthrow is mostly medium to low.

Planting success generally is good, and replants are rarely needed. Competition from brush and alder generally is slight to moderate, and extensive control measures are not required. However, on Desolation soils and on Slickrock soils having slopes of less than 25 percent, competition is severe.

Logs are more difficult to yard from soils in this group than from soils in group 1. Yarded logs commonly gouge areas of soil that are convex. This may cause gullies.

These soils are wet later in the spring and earlier in the fall than soils in group 1, and use of equipment should be restricted to the summer months. Roads need more material for base stabilization and surfacing, and, because of small slumps, maintenance needs are also greater than on soils in group 1.

FOREST MANAGEMENT GROUP 3

This group consists of soils in the Astoria, Blachly, Honeygrove, and Preacher series. These soils are on mountains and have dissected, gently sloping to steep slopes that generally are less than 37 percent. They are well drained and over 40 inches deep.

Douglas-fir is the species best suited to these soils. Its timber site class is 2. The hazard of erosion is mainly moderate, but ranges to high. The hazards of slump and slide and of windthrow are low to medium.

Planting success generally is good, and replants are seldom necessary. Competition from brush and alder is slight to moderate, but extensive control measures generally are not required.

The terrain between drainages is relatively smooth, but the numerous drainages make yarding of logs, spraying, tree planting, and similar management practices difficult. Tractors and other vehicles cause severe compaction on these soils during most of the year. For this reason, operation of vehicles should be restricted when the soils are wet. Unless a road is built, two of the soils that have slopes of as much as 50 percent are too steep for the safe operation of most tractors. Along temporary roads and trails, water bars are needed to prevent the accumulation of water. Most roads require frequent maintenance of culverts and road fills.

FOREST MANAGEMENT GROUP 4

This group consists of soils in the Apt, Astoria, Blachly, Honeygrove, and Slickrock series and the Honeygrove series, heavy variant. These soils generally are similar to the soils in group 3, except that they have sloping to steep, dissected, uneven slopes. The hazard of erosion generally is moderate or high.

Generally, the timber site class is 2 for Douglas-fir, which is the species best suited to these soils. On the Honeygrove soil, heavy variant, however, the timber site class is 3 and the planting success is fair. The hazard of windthrow is low to medium.

Slumping and sliding are medium to high hazards on the soils in this group. Logs are difficult to yard because of undulations in the slope and the numerous drainages. Logs tend to gouge the soil areas that are convex. Frequent settings are required to avoid yarding logs across drainages. Other management practices are difficult because of the uneven, dissected surface. These soils remain moist for long periods each year and are subject to compaction.

Maintaining roads is expensive because of the frequent drainage crossings and the numerous slumps and slides. Water bars on temporary roads and trails help to prevent the accumulation of water.

About half the soils in this group have slopes of 37 to 50 percent. Unless a road is built, the slopes of this

undulating, dissected terrain are too steep for the safe use of tractors.

FOREST MANAGEMENT GROUP 5

This group consists mainly of nearly level to steep soils in the Hembre, Lint, and Preacher series. These soils are on smooth mountain slopes, ridges and spurs, and high terraces. They are well drained to moderately well drained. The hazard of erosion is mostly moderate but ranges to slight. Slopes range from 0 to 37 percent. Also in this group is Colluvial and Alluvial land, which occupies narrow, winding areas.

The timber site class for Douglas-fir is 2. Hemlock grows nearly as well as Douglas-fir on Hembre and Lint soils. The hazard of windthrow generally is medium to high.

Planting success is greatly improved if treatment and planting are done soon after the timber harvest. Competition from brush and alder is slight to moderate on Preacher soils. On Lint and Hembre soils, however, it is severe, and care must be taken after harvest to minimize this competition. Young alder can be killed by spraying, but this may release understory salmonberry and other brush, which must be treated. If salmonberry and other sprouting shrubs are present in the understory, postlogging control by chemical or mechanical measures likely will be necessary to insure survival of planted stock.

The terrain is only a slight limitation on these smooth slopes. Equipment limitations are moderate because of slope. In summer there is a period of 3 to 5 months when heavy vehicles cause only slight compaction of the soil. Along temporary roads and trails, water bars should be constructed.

FOREST MANAGEMENT GROUP 6

This group is made up of nearly level to steep soil in the Astoria, Depoe, and Fendall series. These soils are 20 to 72 inches deep. They occur on uneven mountain slopes and on a marine terrace along the coast. The soils are well drained except for the Depoe soil, which is poorly drained. The hazard of erosion generally is moderate to slight, but on Fendall gravelly clay loam, 37 to 50 percent slopes, it is high.

The species best suited to most of these soils is Western hemlock. Sitka spruce is suited to the Depoe soil, to areas of the Fendall soils on ridges, and to Astoria clay loam, uneven, 10 to 25 percent slopes. The timber site class for Douglas-fir is mostly 2, but it is high 3 on the Fendall soil having slopes of 37 percent. Windthrow is a medium to high hazard.

Planting success is good in most places if the soils are properly prepared. Competition from brush is severe, and from alder generally is moderate to severe. Extreme care must be taken during and after logging to avoid severe competition from salmonberry and alder. If salmonberry and other sprouting shrubs are present, postlogging control by chemical or mechanical means may be necessary. Young alder can be killed easily by spraying, but competing brush in the understory must also be destroyed. Because mineral soil exposed during clear harvesting provides an excellent seedbed for alder, scarification is not a suitable method for controlling brush.

Generally, the terrain is only a slight to moderate limitation to management. Yarded logs commonly gouge areas of soil that are convex. As a result, water is channeled in the compacted trough, and this can cause gullying. Many landings and settings are needed to keep from yarding logs across drainages.

Equipment limitations are severe. These soils generally remain moist in most summers, and hence they are susceptible to compaction all year. Unless a road is built, the Fendall soil having slopes of 37 to 50 percent is too steep for the safe operation of most tractors. Along roads and trails, water accumulates and cuts gullies, but water bars help to prevent loss of soil through gullying.

FOREST MANAGEMENT GROUP 7

This group consists of gently sloping to steep soils in the Apt, Blachly, Bohannon, Desolation, Digger, Hatchery, Honeygrove, Klickitat, Skinner, and Slickrock series. These soils generally are 20 to 40 inches deep but in places are as much as 96 inches deep. They are on mountain ridges and spurs and are well drained. Slopes generally are less than 37 percent. The hazard of erosion is mainly moderate but ranges from slight to high.

Douglas-fir grows well on these soils. Its timber site class is 3. The windthrow hazard mostly is medium to high. Care must be taken in placing cutting lines to minimize windthrow losses.

Planting success generally is fair. Competition from brush generally is severe, but from alder it normally is only slight. Vine maple and salal are the two brush species that most commonly compete with plantations on these soils. Control by chemical or mechanical means is often necessary. On Bohannon and Digger soils, competition from brush is only slight and control may not be necessary. On Skinner soils there may be competition from salmonberry, which nearly always needs some control in order to minimize competition with the plantation. Competition from alder is severe on Skinner soils.

Terrain generally is not a limitation, because of smooth slopes, and it does not interfere with most management activities.

Most of the soils in this group are medium textured and gravelly and resist compaction. As a result, vehicles can operate for 4 or 5 months of the year without danger of severe compaction. Skinner soils are an exception because the hazard of compaction on these soils is high for 10 to 11 months each year. To help control erosion, disturbance of the organic mulch on the soil surface should be minimized. Abandoned roads and trails should have water bars to prevent the accumulation of water.

FOREST MANAGEMENT GROUP 8

This group consists of soils in the Apt, Bohannon, Digger, Hatchery, Honeygrove, Klickitat, Skinner, and Slickrock series. These soils are similar to soils in group 7, except that they are steep. The timber site class, planting success, adapted species, and degree of competition from alder are similar. Because the slopes are greater, however, the hazard of erosion on the soils in this group is high. Limitations to most management practices are slight to moderate, and equipment limitations are moderate. Competition from brush is mostly slight, and rock outcrops are more common.

Terrain is only a slight to moderate limitation to yarding, planting, spraying, and similar activities because

of the smooth slopes. Unless a road is built, most slopes are too steep for the safe operation of tractors. There is very little hazard of compaction on these soils. Rock outcrops are few to common and may cause some difficulty in falling trees, yarding logs, and building roads. Disturbance of the organic mulch should be kept at a minimum. Temporary roads and trails should be protected from gullying by water bars.

Competition from brush is severe on Klickitat and Skinner soils, and to assure adequate regeneration, brush on these soils can be controlled by spraying or mechanical removal.

FOREST MANAGEMENT GROUP 9

This group consists of soils in the Apt, Bohannon, Desolation, Digger, Hatchery, Honeygrove, Klickitat, Skinner, and Slickrock series. These soils are mostly similar to soils in group 7, except that they are dissected and are moderately steep to steep. The timber site class, windthrow hazard, degree of competition from brush and alder, and planting success are similar. Management of the soils in this group differs, however, because terrain limitations to many management practices are moderate. The hazard of erosion is moderate and high. Equipment limitations are imposed by slopes of 25 to 50 percent, and rock outcrops are more common.

After these soils have been properly prepared, planting success is fair. Competition from brush is severe on most of the soils but is slight on the Bohannon and Digger soils. The brush generally is vine maple and salal on Klickitat soils, and salmonberry on Skinner soils. To control these shrubs and reduce competition with the plantation, chemical or mechanical means are necessary.

Equipment limitation generally is slight on slopes up to 37 percent and moderate on slopes of 37 to 50 percent. The soils are not easily compacted during the 4 to 5 summer months. Unless a road is built, however, the steeper slopes are not considered safe for the operation of most tractors. To avoid dragging logs across the numerous incised drainages, numerous yard settings are required. The organic mulch should be protected, and temporary roads and trails should have water bars to prevent gullying.

FOREST MANAGEMENT GROUP 10

This group consists of soils in the Bohannon, Digger, and Slickrock series. In most respects these soils are similar to soils in group 7, but they have very steep to extremely steep slopes. The timber site class, planting success, windthrow hazard, and competition from alder are similar. Management on the soils of this group differs because terrain limitations to most management practices are severe, the hazard of erosion is very high, equipment limitations are severe, competition from brush hazard is only slight, and rock outcrops are common.

Compaction is not a problem on these soils, but the operation of tractors generally requires the construction of many roads. Waste materials from road construction slide downslope for great distances and commonly bury productive soils under less productive, cobbly subsoil material. The slide hazard is great on these soils, as slides can be caused by the accumulation of water that results from yarding or road construction.

Such management practices as thinning, spraying, planting, and cruising are difficult and hazardous because of the very steep slopes. Rock outcrops are common and may cause tree breakage during falling and cause difficulty in yarding.

Disturbance of the organic mulch, especially by yarding of logs over the surface and by slash burning, will cause some soil erosion. To keep the soils from gullying, trails and temporary roads should be protected with water bars.

FOREST MANAGEMENT GROUP 11

This group consists of soils in the Bohannon, Fendall, Hatchery, Klickitat, Skinner, and Slickrock series. In most respects these soils are similar to soils in group 7, but they occur on both smooth and dissected terrain and have very steep to extremely steep slopes. The timber site class and the degree of competition from brush and alder are similar. Management on the soils of this group differs because terrain limitations are severe, the hazard of erosion is very high, planting success is poor, equipment limitations are severe, the windthrow hazard is high, and rock outcrops are common.

As much as possible, trees should be planted in the deepest soil available in a given area. Plantation success also depends on dead shade and protection from animals. Plant competition is mainly from salal and vine maple, but on Skinner and Fendall soils, salmonberry may compete with plantations. Numerous yarding settings are required because the terrain is dissected. The skidding of logs on steep soils generally removes the organic mulch and commonly results in severe gully erosion. Also, sheet erosion may be severe if the organic mulch is destroyed.

Such management practices as planting, spraying, and thinning are especially difficult and hazardous on these very steep soils.

FOREST MANAGEMENT GROUP 12

This group consists of soils in the Digger, Kilchis, and Trask series. These soils are very gravelly, cobbly, and well drained, and they have slopes that exceed 50 percent.

The best suited tree is Douglas-fir, but the timber site class for this species is 4. Trees grow quickly in diameter and height to an age of about 60 years, and then their growth markedly decreases. Competition from brush generally is slight, and that from alder is slight. However, brush competition is severe on Kilchis soils, and the brush must be sprayed or mechanically removed where possible to achieve plantation success. Planting success on all soils in the group is poor. To take advantage of the deepest soils, planting must be done carefully, but replants generally are necessary. The hazard of windthrow is high.

Terrain is a severe limitation to most management operations. The use of equipment is limited because slopes are steep and rock outcrops are very common. The hazard of erosion is very high. To prevent gully erosion, all temporary roads and trails must be carefully protected by water bars. Falling trees, skidded logs, and animals may disrupt the organic mulch and leave the mineral soil exposed and highly susceptible to erosion. In many places, timber harvest has been indefinitely deferred because of the low yield, erosion hazard, and difficulty of regeneration.

FOREST MANAGEMENT GROUP 13

The only soil in this group is Ferrelo loam, 5 to 30 percent slopes. This gently sloping to moderately sloping soil occurs along the coast on ridges on stabilized sand dunes and beaches. It is a well-drained soil.

This soil is in timber site class 3 for Douglas-fir. This species grows in most areas of the soil, but shore pine also grows well.

Competition from brush is severe and must be controlled before planting. Competition from alder is only slight and is not a problem to regeneration. Planting success is fair but replants are sometimes necessary.

The hazard of compaction is low, and most management practices can be done almost any month of the year without the risk of severe soil compaction. Such management practices as spraying, planting, and thinning are simplified because of the smooth terrain. Unless water is channeled, the hazard of erosion is only slight. Roadside ditches should be drained frequently to prevent gullying, unless most of the underlying sand is unconsolidated. Water bars should be used to protect temporary roads and trails from gullying.

Engineering Uses of the Soils [5]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigations systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 2, 3, and 4, which show, respectively, results of engineering laboratory tests on soil samples; several estimated soil properties significant to engineering; and interpretations for various engineering uses.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 3 and 4, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many areas mapped as a given soil may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists but are unfamiliar to engineers. The Glossary defines many of these terms commonly used in soil science.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system used by the Forest Service and SCS engineers, Department of Defense, and others, and the AASHO system adopted by the American Association of State Highway Officials (*2, 13, 22*).

In the Unified system (*22*), soils are classified according to particle-size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML–MH.

The AASHO system (*2*) is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 2; the estimated classification, without

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group index numbers, is given in table 3 for all soils mapped in the survey area.

Engineering test data

Table 2 contains engineering test data for some of the major soil series in the Alsea Area. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Compaction (or moisture-density) data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the *optimum moisture content* is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed *maximum dry density*. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The *plastic limit* is the moisture content at which the soil material changes from the semisolid to plastic state; and the *liquid limit*, from a plastic to a liquid state. The *plasticity index* is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 3, but in table 2 the data on liquid limit and plasticity index are based on tests of soil samples.

Soil properties significant to engineering

Several estimated soil properties significant in engineering are given in table 3. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 3.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Depth to seasonal high water table is distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in table 3 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 18 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 3 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at wilting point. In table 3 it is expressed as inches of water per inch of soil.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Corrosivity, as used in table 3, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosivity for concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of low means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations

Table 4 provides suitability ratings of soils as a source of topsoil, sand and gravel, road fill, and materials for road base. It also rates the need for stabilizing the road base and the hazards of slumps and slides. In addition, the table gives soil features that affect the seeding of cut and fill slopes; road location; reservoir areas and embankments of ponds; and winter grading. Finally, the table lists the hydrologic group for the soils in each series.

The estimated interpretations in table 4 are based on the engineering properties of soils shown in table 3, on test data for soils in this survey area and others nearby and adjoining, and on the experience of engineers and soil scientists with the soils of the Alsea Area.

Following are explanations of some of the columns in table 4.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or its response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that will result at the area from which topsoil is taken.

TABLE 2.—*Engineering*

[Tests performed by Region 6, Forest Service, U S. Department of Agriculture in accordance

Soil name and location	Depth	Moisture density [1]		Cobblestones and stones [2]	Mechanical analysis [3]		
					Percentage passing sieve [4]—		
		Maximum dry density	Optimum moisture		3- in.	¾- in.	No. 4 (4.7 mm)
	In	*Lb per cu ft*	*Percent*	*Percent*			
Apt clay, 5 to 25 percent slopes: S½NW¼SW¼NE¼ sec. 19, T. 14 S., R. 7 W.	8–19	84	32	0	100	97	96
	24–37	83	34	5	--------	93	85
Astoria clay loam, dissected, 5 to 25 percent slopes: NE. corner of SE½NE¼SE¼ sec. 10, T. 13 S , R 8 W	5–14	75	43	0	--------	99	88
	23–36	78	40	0	--------	99	94
Blachly clay loam, basalt substratum, uneven, 25 to 37 percent slopes: [7] NW¼NE¼ sec. 18, T. 13 S., R. 7 W	9–16	79	39	0	--------	100	99
	16–24	61	50	0	100	97	96
	24–36	85	37	0	--------	--------	99
Bohannon loam, ridge, 5 to 25 percent slopes NE¼SE¼SW¼ sec 4, T. 14 S., R. 10 W.	4–17	77	37	5	--------	97	94
	17–24	87	32	10	--------	95	87
Digger gravelly loam, dissected, 50 to 75 percent slopes: S½SE¼SW¼NW¼ sec. 10, T 14 S , R. 7 W.	18–30	98	23	20	100	90	80
Hatchery gravelly loam, dissected, 50 to 85 percent slopes: S½SE¼SW¼NE¼ sec 20, T. 14 S., R. 7 W.	9–32	95	28	10	100	90	61
Hembre clay loam, 5 to 25 percent slopes SW. corner, SE¼NW¼ sec 5 (oversize), T 14 S , R. 11 W.	52–80	85	34	0	--------	100	99
Honeygrove clay, basalt substratum, 0 to 25 percent slopes: [7] N½NE¼NW¼ sec. 21, T. 14 S., R. 7 W.	6–16	78	39	0	--------	100	99
	17–33	85	34	0	--------	--------	99
Lint silty clay loam, 3 to 25 percent slopes: NW¼SE¼SW¼NE¼ sec. 28, T. 13 S., R. 11 W.	20–28	84	32	0	--------	--------	100
Marty silty clay loam, 0 to 25 percent slopes: SW¼SE¼ sec. 7, T. 15 S., R 7 W.	14–26	87	34	0	100	94	92
	39–60	91	31	0	--------	99	97
Preacher clay loam, ridge, 0 to 25 percent slopes: N½NW¼NW¼SW¼ sec. 24, T. 15 S , R 10 W.	28–42	83	33	0	--------	100	99
Slickrock gravelly loam, 25 to 37 percent slopes: W½SW¼NW¼NE¼ sec. 4, T. 15 S., R. 9 W.	7–14	82	34	10	--------	99	95
	23–47	94	26	30	100	93	91

[1] Based on AASHO Designation T 99–57, Method A (*2*).
[2] Estimated volume of cobblestones and stones with a diameter greater than 3 inches that were discarded during field sampling.
[3] Mechanical analysis according to the AASHO Designation T 88–54. Results by this procedure frequently may differ from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material that is coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. Variation may also be expected

test data

with standard procedures of the American Association of State Highway Officials (AASHO)(*2*)]

Mechanical analysis [3]—Continued							Liquid limit	Plasticity index	Classification	
Percentage passing sieve [4]—Continued			Percentage smaller than [4]—							
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO [5]	Unified [6]
85	82	62	57	44	27	21	55	12	A-7-5(8)	MH
69	67	46	42	31	21	12	58	6	A-5(3)	SM
77	60	40	35	28	18	12	65	10	A-5(2)	SM
87	74	55	51	40	27	21	63	11	A-7-5(6)	MH
98	82	60	55	48	34	25	60	12	A-7-5(8)	MH
96	88	70	63	51	36	31	61	12	A-7-5(11)	MH
99	92	73	66	54	41	34	62	13	A-7-5(12)	MH
88	79	42	33	22	10	5	(8)	------------	A-4(1)	SM
84	79	43	34	22	9	4	(8)	------------	A-4(1)	SM
79	73	46	41	32	21	15	38	8	A-4(2)	SM
43	30	18	16	10	3	1	(8)	------------	A-1-b(0)	SM
98	89	67	61	47	28	17	52	9	A-5(8)	MH
98	84	60	58	49	37	26	60	13	A-7-5(9)	MH
99	94	71	68	58	46	40	61	12	A-7-5(11)	MH
99	99	76	60	37	19	11	46	7	A-5(9)	ML
90	84	61	55	43	25	17	48	9	A-5(6)	ML
95	91	73	64	47	31	24	50	11	A-7-5(10)	ML-MH
99	95	60	51	35	20	13	51	12	A-7-5(7)	MH
91	79	37	28	18	8	5	48	8	A-6(1)	SM
89	81	46	42	34	22	15	42	10	A-5(2)	SM

due to the different dispersion techniques used. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

[4] Based on total volume of material. Laboratory test data corrected for amount discarded during field sampling.

[5] Based on AASHO Designation M 145-49.

[6] Based on the Unified Soil Classification System (*22*).

[7] For soil profile description of these soils see pages 10 and 23 respectively.

[8] Nonplastic.

TABLE 3.—*Estimated*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in for referring to other series that appear in the first column of this table. The symbol < means

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface of typical profile	Classification: USDA texture	Classification: Unified	Classification: AASHO
	Inches	*Inches*	*Inches*			
Alsea: AaA, AaB	(1)	35–60	0–60	Loam	ML	A-4
Apt: AcD, AcE, AcF, AdF	(1)	(2)	0–24 24–63	Clay Gravelly silty clay and very gravelly silty clay loam.	MH SM or GM	A-7 A-5
Astoria: ArD, ArE, ArF, AsE, AsF, AtD, AuD, AuE.	50–72	(2)	0–14 14–50 50	Clay loam Clay and very gravelly clay loam. Siltstone.	SM MH	A-5 or A-7 A-7
Blachly: BaD, BaE, BaF, BbE, BcE, BcF, BdD, BeD, BeE, BeF, BfE, BgE, BhD, BhE.	(1)	(2)	0–9 9–60	Clay loam Clay	ML MH	A-5 A-7
*Bohannon: BkD, BlE, BlF, BlG, BmE, BmF, BmG, BnE, BnF, BoG, BpF, BrG, BsE, BsF, BsG, BtE, BtF, BtG. For the Slickrock part of BsE, BsF, BsG, BtE, BtF, and BtG, see the Slickrock series.	20–40	(2)	0–24 24–120	Gravelly loam Arkoskic sandstone.	SM	A-2 or A-4
Brenner: Bu	(1)	[4] 0–6	0–48	Silty clay loam	ML	A-7
Chitwood: ChA, ChC	(1)	[4] 6–24	0–6 6–60	Silt loam Silty clay loam and silty clay	ML MH	A-4 or A-6 A-7
Clatsop: Cs	(1)	[5] 0–6	6–0 0–18 18–36	Peat Silty clay loam and silty clay Silty clay loam	Pt OL CH	A-8 A-7 A-7
Colluvial and Alluvial land: Cu	(1)	(2)	(6)	Variable	(6)	(6)
Depoe: De	(1)	[4] 0–6	0–19 19–29 29–33	Silty loam and clay loam Indurated ortstein sand Sand	ML -------- SW	A-4 -------- A-1
Desolation: DfE	(1)	(2)	0–50 50–90	Clay Very gravelly clay	CL GC	A-6 A-2 or A-6
*Digger: DgE, DgF, DgG, DlF, DlG, DmE, DpE, DpF, DsE, DsF. For the Apt part of DpE, DpF, DsE, and DsF, see the Apt series	20–40	(2)	0–30 30	Gravelly loam Sandstone.	SM or GM	A-4 or A-2
Dune land: Du	(1)	(2)	0–60	Sand	SP-SM	A-1
Fendall: FdE, FdF, FdG	20–40	(2)	0–13 13–31 31	Gravelly clay loam and clay loam Clay and gravelly clay Shale.	CL ML	A-7 A-7
Ferrelo: FeD	(1)	(2)	0–10 10–72	Loam Fine sandy loam and sandy loam.	ML SM	A-4 A-4
*Hatchery: HaE, HaF, HaG, HcF, HcG, HeE, HeF, HgE, HgF. For the Honeygrove part of HeE, HeF, HgE, and HgF, see the Honeygrove series	20–40	(2)	0–32 32	Gravelly loam Basalt.	SM	A-1 or A-2
Hebo: Hh	(1)	[4] 0–6	0–19 19–35	Silty clay loam and silty clay Silty clay	MH CH	A-7 A-7

See footnotes at end of table.

properties

uch mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions
ess than. Dashes in a column indicate that information was not available or does not apply]

Coarse fraction greater than 3 inches in diameter	Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Corrosivity of uncoated steel
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)						
Percent							*Inches per hour*	*Inches per inch of soil*	*pH value*	
0	100	100	85–95	60–75	30–40	5–10	0.63–2.0	0.16–0.18	5.6–6.0	Moderate.
0	95–100	80–90	80–90	60–70	50–60	11–15	0.20–0.63	0.14–0.16	5.6–6.5	High.
5	55–90	45–75	40–70	35–50	50–60	5–10	0.20–0.63	0.11–0.13	5.1–6.0	High.
0	85–90	75–85	55–65	35–45	50–65	7–15	0.63–2.0	0.19–0.21	4.5–5.0	High.
0	80–95	70–95	65–80	50–60	50–65	11–20	0.63–2.0	0.13–0.15	<4.5	High.
0–5	90–100	80–100	70–80	60–75	50–65	5–10	0.63–2.0	0.14–0.17	5.6–6.0	High.
0–15	70–100	70–100	65–100	50–85	50–65	11–20	0.20–0.63	0.12–0.15	5.6–6.0	High.
0–15	75–95	60–90	50–85	30–50	[3] NP	[3] NP	2.0–6.3	0.12–0.14	4.5–5.5	Low.
0	100	100	95–100	85–95	41–50	11–15	0.06–0.20	0.17–0.21	5.1–5.5	High.
0–10	90–100	85–100	80–100	70–90	35–40	5–15	0.20–0.63	0.19–0.21	4.5–5.0	High.
0	100	100	95–100	85–95	50–60	11–20	0.06–0.20	0.15–0.21	4.5–5.0	High.
---	---	---	---	---	---	---	0.20–0.63	0.30–0.40	4.5–5.0	High.
0	100	100	95–100	85–95	41–50	11–20	0.20–0.63	0.15–0.17	5.1–6.5	High.
0	100	100	95–100	85–95	50–60	25–30	0.20–0.63	0.19–0.21	6.1–6.5	High.
([6])	([6])	([6])	([6])	([6])	([6])	([6])	---	---	4.5–5.0	High.
0	100	100	90–100	70–90	30–40	5–10	0.2–0.63	0.19–0.21	4.5–5.5	High.
---	---	---	---	---	---	---	<0.06	---	---	
0	100	100	40–50	0–5	[3] NP	[3] NP	6.3–2.0	0.05–0.07	4.4–5.0	High.
10–40	75–100	70–95	60–95	50–90	35–40	11–15	0.20–0.63	0.12–0.16	4.0–5.0	High.
25–40	30–50	25–45	20–40	15–40	35–40	11–15	0.20–0.63	0.09–0.12	4.5–5.0	High.
15–30	50–80	50–75	45–75	20–45	35–40	5–10	2.0–6.3	0.10–0.12	5.6–6.0	Low.
0	100	100	50–70	5–15	[3] NP	[3] NP	6.30–20.0	0.05–0.07	---	Low.
0	80–90	70–90	65–90	50–85	41–45	11–15	0.63–2.0	0.16–0.21	4.5–5.0	High.
0	75–95	65–90	60–90	50–85	41–50	11–20	0.2–0.63	0.12–0.16	4.4–5.0	High.
0	100	100	85–95	60–75	[3] NP	[3] NP	2.0–6.3	0.16–0.18	4.5–5.0	High.
0	100	100	60–85	35–50	[3] NP	[3] NP	2.0–6.3	0.11–0.15	5.1–5.5	High.
10–20	60–70	40–50	25–35	15–35	[3] NP	[3] NP	2.0–6.3	0.10–0.12	6.1–6.5	Low.
0	100	100	95–100	85–95	50–60	20–30	0.2–0.63	0.15–0.19	4.5–5.0	High.
0	100	100	95–100	90–95	55–70	35–45	<0.06	0.15–0.17	4.5–6.0	High.

479-500—73——5

TABLE 3.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface of typical profile	Classification		
	Bed-rock	Seasonal high water table		USDA texture	Unified	AASHO
	Inches	*Inches*	*Inches*			
Hembre: HlD	(1)	(2)	0–80	Clay loam	MH or ML	A–5 or A–6
Honeygrove. HmD, HmE, HmF, HnF, HoE, HoF, HrD, HrE, HsD, HsE, HsF, HtD, HtE, HuD, HvE.	(1)	(2)	0–72	Clay	MH	A–7
Honeygrove, heavy variant: HwD, HyE	40–100	(2)	0–50	Clay	MH	A–7
			50	Siltsone		
Kilchis· KcG	12–20	(2)	0–13	Very cobbly loam	GM	A–2 or A–4
			13	Basalt.		
*Klickitat: KkE, KlE, KlF, KlG, KmE, KmF, KmG, KnF, KoF. For the Blachly part of KoF, see the Blachly series.	40–96	(2)	0–47	Very gravelly clay loam and very gravelly loam.	GM	A–2 or A–4
			47	Basalt.		
Knappa. KpA, KpB, KsC	(1)	(2)	0–9	Silt loam	ML	A–4
			9–60	Silty clay loam and silt loam	CL	A–6
Landslides-Apt material· La	(1)	0–60	0–60	Gravelly silty clay	SM	A–5
Landslides-Slickrock material: Ls	(1)	0–60	0–60	Gravelly clay loam	SM	A–5
Lint LtD, LtE	(1)	(2)	0–60	Silty clay loam and silt loam	ML	A–5
Loamy alluvial land Lu	(1)	(7)	0–29	Stratified fine sandy loam and very fine sandy loam.	SM or ML	A–4
			29–60	Gravelly sand	SW or GW	A–1
Marty: MaD, MaE, MrD	(1)	(2)	0–60	Silty clay loam, loam, and clay loam	ML or MH	A–7 and A–5
Mulkey: MuD, MuF	20–40	(2)	0–10	Loam	OL	A–4
			10–26	Gravelly loam	ML or SM	A–4
			26	Diorite or gabbro		
Nehalem Ne	(1)	(2)	0–60	Silt loam	CL	A–6
Nestucca· NsA, NsB	(1)	[4] 0–6	0–40	Silty clay loam	CL	A–6
Preacher: PhD, PhE, PlF, PrD, PrE	40–72	(2)	0–42	Clay loam	MH	A–7
			42–60	Sandy loam	ML or SM	A–4 or A–2
Sandy alluvial land: Sa	(1)	(7)	0–6	Sandy loam	SM	A–2
			6–60	Gravelly sand	SW or GW	A–1
*Skinner. SgE, SgF, SgG, SkF, SlE, SnF. For the Desolation part of SlE and SnF, see the Desolation series.	40–60	(2)	0–29	Gravelly clay loam and cobbly clay loam	CL or SC	A–6
			29–45	Very cobbly light clay	ML	A–7
			45	Basalt.		
Slickrock· SoD, SrD, SsD, SsE, SsF, StE, StF, SuE.	48+	(2)	0–23	Gravelly loam and gravelly clay loam.	SM	A–5
			23–55	Cobbly and very cobbly clay loam.	SM	A–5
			55	Tuffaceous sandstone.		
Tidal marsh Tm	(1)	[5] 0–6	0–60	Clay	CH	A–7
Trask: TrG	12–20	(2)	0–12	Gravelly loam	GM	A–2
			12	Sandstone.		

[1] Bedrock was not observed to the normal depth of observation: about 5 feet.
[2] The water table was not observed to the normal depth of observation: about 5 feet or to bedrock, whichever is shallower.
[3] NP is nonplastic.
[4] From November to April in most years.

properties—Continued

Coarse fraction greater than 3 inches in diameter	Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Corrosivity of uncoated steel
Percent							*Inches per hour*	*Inches per inch of soil*	*pH value*	
0	95–100	95–100	85–95	65–80	35–55	5–15	0. 63–2. 0	0. 19–0 21	4. 5–5. 0	Moderate.
0–20	70–100	70–100	60–100	50–85	55–70	11–15	0. 20–0. 63	0. 14–0. 16	5. 1–6. 5	High.
0–10	85–100	85–100	75–90	60–85	60–70	11–15	0. 2–0. 63	0. 14–0. 16	4. 5–5. 5	High.
35–45	55–75	50–70	40–65	30–50	[3] NP	[3] NP	2. 0–6. 3	0. 04–0. 09	5. 1–6. 0	Low.
25–35	45–65	40–60	35–55	25–45	30–40	11–15	2. 0–6. 3	0. 06–0. 1	4. 5–5. 5	Moderate.
0	100	100	90–100	70–90	30–40	5–10	0. 63–2 0	0 19–0. 21	<4. 5	Moderate.
0	90–100	85–100	80–100	75–95	30–40	11–15	0. 63–2. 0	0. 19–0 21	4. 4–5. 5	Moderate.
0	85–90	65–75	60–70	40–50	50–60	5–10	0. 2–0 63	0. 11–0. 13	5. 1–6. 5	High.
0–30	75–100	70–95	65–85	35–50	41–50	5–10	0 63–2 0	0. 13–0. 17	5. 1–6. 0	High.
0	100	95–100	95–100	70–85	41–50	5–10	0 63–2 0	0. 19–0. 21	5. 0–5. 5	High.
------------	100	100	70–90	40–60	[3] NP	[3] NP	2. 0–6. 3	0 12–0 16	------------	Moderate.
------------	50–70	40–60	20–30	0–5	[3] NP	[3] NP	6. 3–20. 0	0. 04–0. 06	------------	High.
0–15	75–100	70–100	65–95	50–75	45–55	7–15	0. 63–2 0	0. 16–0. 20	4. 5–6. 0	High.
0–5	100	100	85–95	60–75	30–40	5–10	2. 0–6. 3	0 16–0 18	4. 5–5. 0	High.
0–30	65–75	65–75	55–70	40–55	30–40	5–10	2. 0–6 3	0. 12–0. 15	5. 0–5. 5	High.
0	95–100	95–100	90–100	70–90	30–40	11–15	0 63–2 0	0. 1–0. 21	5. 0–5. 5	High.
0	100	100	95–100	85–95	30–40	11–15	0. 20–0. 63	0. 19–0. 21	4 4–5. 0	High.
0	95–100	80–100	70–100	55–80	50–55	11–15	0. 63–2. 0	0. 16–0. 21	5. 0–5. 5	High.
0	80–100	75–100	45–85	20–65	[3] NP	[3] NP	2. 0–6. 3	0. 10–0. 17	4. 5–5. 0	High.
------------	100	100	60–70	25–35	[3] NP	[3] NP	2. 0–6 3	0. 07–0 09	------------	Moderate.
------------	50–70	40–60	20–30	0–5	[3] NP	[3] NP	6 3–20. 0	0. 04–0. 06	------------	High.
10–25	75–85	65–75	60–75	45–60	30–40	11–15	0 2–0. 63	0. 15–0. 17	4. 4–5. 0	High.
30–50	70–80	60–75	55–70	50–60	41–50	15–20	0. 20–0 63	0. 12–0. 14	4. 4–5. 0	High.
0–10	75–100	70–95	65–85	35–50	41–50	5–10	0. 63–2. 0	0. 15–0. 17	5. 1–6. 0	High.
30–55	75–90	70–85	60–75	40–50	41–50	5–10	0. 63–2. 0	0. 12–0. 14	5. 1–6. 0	High.
0	100	100	90–100	75–95	50–60	25–30	<0 06	0. 14–0. 16	8. 5–9. 0	Very high.
5–20	40–60	25–50	25–45	15–35	30–40	5–10	2. 0–6. 3	0. 10–0. 14	4 5–5. 0	High.

[5] Subject to tidal overflow, especially by high tides in winter.
[6] Too variable, requires onsite investigation before determinations can be made.
[7] Periodic overflow by flooding streams.

TABLE 4.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in referring to other series that appear

Soil series and map symbols	Suitability as source of—				Need for road base stabilization
	Topsoil	Sand and gravel	Road fill	Road base materials	
Alsea: AaA, AaB	Good	Not suitable: excessive fines.	Fair: A-4	Poor	Medium
Apt: AcD, AcE, AcF, AdF	Fair: clay texture	Not suitable: excessive fines	Fair to poor: A-5 and A-7	Poor	Medium to high
Astoria: ArD, ArE, ArF, AsE, AsF, AtD, AuD, AuE	Fair: very strongly acid	Not suitable: excessive fines	Fair to poor: A-4 to A-7.	Poor	Medium
Blachly: BaD, BaE, BaF, BbE, BcE, BcF, BdD, BeD, BeE, BeF	Fair: excessive fines.	Not suitable: excessive fines	Poor: A-7	Poor	Medium to high
Blachly, basalt substratum: BfE, BgE, BhD, BhE	Fair: excessive fines	Not suitable: excessive fines (possible quarry rock below depth of 5 to 12 feet).	Poor: A-7	Poor	Medium to high
*Bohannon: BkD, BlE, BlF, BlG, BmE, BmF, BmG, BnE, BnF, BoG, BpF, BrG, BsE, BsF, BsG, BtE, BtF, BtG. For the Slickrock part of BsE, BsF, BsG, BtE, BtF, and BtG, see the Slickrock series.	Poor: 20 percent gravel.	Poor: sedimentary bedrock.	Fair: A-4	Poor	Low
Brenner: Bu	Good	Not suitable: excessive fines	Poor: A-7	Poor	High
Chitwood: ChA, ChC	Good	Not suitable: excessive fines.	Poor: A-7	Poor	High
Clatsop: Cs	Good	Not suitable: excessive fines.	Poor: A-7	Poor	High
Colluvial and Alluvial land: Cu	Poor: variable materials.	Not suitable: excessive fines.	(2)	(2)	(2)
Depoe: De	Poor: very strongly acid.	Good for sand; high water table; 2 to 4 feet of overburden.	Fair: A-4	Poor	Medium

See footnotes at end of table.

interpretations

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for in the first column of this table]

Slump and slide hazard	Soil features affecting—					Hydrologic group
	Cut and fill slope seedings	Road locations	Ponds		Winter grading	
			Reservoir areas	Embankments		
Low	Low fertility	No serious limitations.	Moderate permeability.	Moderate permeability when compacted.	No serious limitations	B
High	Low fertility; slumping.	Unstable material.[1]	Moderately slow permeability, slopes of 5 to 50 percent.	Moderate permeability when compacted.	Slopes of 5 to 50 percent; clay surface layer.	B
Medium	Low fertility; ravels.	Slopes of 0 to 50 percent.	Moderate permeability, slopes of 0 to 50 percent.	Low permeability when compacted, high piping hazard, low stability.	Slopes of 0 to 50 percent.	B
High	Low fertility	Unstable material.[1]	Moderately slow permeability, slopes of 0 to 50 percent.	Low permeability when compacted, high piping hazard, low stability.	Slopes of 0 to 50 percent.	B
High	Low fertility	Unstable material [1]	Moderately slow permeability, slopes of 5 to 37 percent.	Low permeability when compacted, high piping hazard; low stability.	Slopes of 5 to 37 percent.	B
Medium to high.	Low fertility; droughty.	Stones hinder hauling and grading.[1]	Moderate permeability, slopes of 5 to 100 percent.	Moderate permeability when compacted, high piping hazard, moderate stability.	Slopes of 5 to 100 percent; gravelly surface layer.	B
Low	Wetness; low fertility.	Poorly drained, seasonal high water table.	Slow permeability.	Moderate permeability when compacted	High water table during winter, poor surface drainage.	C (drained), D (undrained).
Medium	Low fertility	Internal drainage is restricted.	Slow permeability.	Low permeability when compacted, moderate to low piping hazard.	Water table at a depth of 6 to 24 inches during winter.	C
High	Low fertility	Subject to tidal overflow.	Moderately slow permeability.	High organic-matter content.	May be flooded by high tides in winter.	D
(2)	(2)	Unstable, seepy areas, subject to overflow.	(2)	(2)	Slopes of 5 to 30 percent, fair to poor surface drainage.	C
Low	Low fertility; droughty.	Poorly drained	Very slow permeability.	Moderate permeability when compacted; high piping hazard	High water table during winter; poor surface drainage.	D

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—				Need for road base stabilization
	Topsoil	Sand and gravel	Road fill	Road base materials	
Desolation: DfE	Fair: excessive fines.	Not suitable excessive fines.	Poor: A–6	Poor	Medium to high.
*Digger DgE, DgF, DgG, DlF, DlG, DmE, DpE, DpF, DsE, DsF. For the Apt part of units DpE, DpF, DsE, and DsF, see the Apt series.	Poor: gravelly throughout.	Poor: sedimentary bedrock.	Fair: A–4	Poor	Low
Dune land Du	Poor: coarse texture.	Good for sand but not suitable for concrete.	Good if side slopes are protected.		
Fendall FdE, FdF, FdG	Fair: 0 to 4 inches; 20 percent gravel.	Not suitable: excessive fines.	Poor: A–1	Poor	Medium
Ferrelo: FeD	Fair: very strongly acid.	Not suitable: excessive fines.	Fair: A–4	Poor	Low
*Hatchery: HaE, HaF, HaG, HcF, HcG, HeE, HeF, HgE, HgF. For the Honeygrove part of units HeE, HeF, HgE, and HgF, see the Honeygrove series.	Poor: 20 percent gravel.	Poor for angular gravel: excessive fines.	Good: A–1	Good	Low
Hebo: Hh	Poor: wetness; excessive fines.	Not suitable: excessive fines.	Poor: A–7	Poor	High
Hembre: HlD	Good	Not suitable: excessive fines.	Fair to poor: A–5 or A–6.	Poor	Medium
Honeygrove: HmD, HmE, HmF, HnF, HoE, HoF, HrD, HrE, HsD, HsE, HsF, HtD, HtE, HuD, HvE, HwD, HyE	Fair: clay texture.	Not suitable: excessive fines.	Poor: A–7	Poor	Medium to high.
Kilchis: KcG	Poor: 40 percent gravel; very steep.	Not suitable: possible source of rock for crushing.	Good to fair: A–2 to A–4.	Good	Low
*Klickitat: KkE, KlE, KlF, KlG, KmE, KmF, KmG, KnF, KoF. For the Blachly part of KoF, see the Blachly series.	Poor: 25 percent gravel.	Not suitable: possible source of rock for crushing.	Good to fair: A–2 or A–4.	Good	Low
Knappa: KpA, KpB, KsC	Good	Not suitable: excessive fines.	Poor: A–6	Poor	Low to medium.
Landslides-Apt material: La	Poor: mixed material; clay texture.	Not suitable: excessive fines.	Fair: A–5	(2)	(2)

See footnotes at end of table.

interpretations—Continued

Slump and slide hazard	Soil features affecting— Cut and fill slope seedings	Road locations	Ponds: Reservoir areas	Ponds: Embankments	Winter grading	Hydrologic group
High	Low fertility; slumping	Unstable materials.	Moderately slow permeability; slopes of 10 to 35 percent.	Low permeability when compacted; low piping hazard.	Slopes of 10 to 35 percent; clay loam and clay surface layer.	B
Medium	Low fertility; sliding. droughty.	Unstable material; bedrock at a depth of 20 to 40 inches.	Moderately rapid permeability; slopes of 5 to 75 percent.	Moderate permeability when compacted; high piping hazard.	Slopes of 5 to 75 percent; gravelly surface layer.	B
		Unstable; hinders hauling.	Porous	High permeability when compacted; high piping hazard.	No serious limitations when moist.	A
Medium	Low fertility	Plastic material	Moderately slow permeability; slopes of 25 to 75 percent.	Low permeability when compacted.	Slopes of 25 to 75 percent; gravelly surface layer.	C
Medium	Low fertility; droughty; erodible.	No unfavorable features.	Moderately rapid permeability; slopes of 5 to 30 percent.	Moderate permeability when compacted; high piping hazard.	Slopes of 5 to 30 percent.	B
Medium	Low fertility; droughty.	Stones hinder hauling and grading.[1]	Moderately rapid permeability, slopes of 25 to 85 percent.	Moderate permeability when compacted; high piping hazard	Slopes of 25 to 85 percent; gravelly surface layer.	B
Low	Low fertility	Internal drainage restricted.	Very slow permeability; seasonal water table.	Low permeability when compacted.	Poorly drained; high water table during winter.	D
High	Low fertility	Unstable material	Moderate permeability; slopes of 5 to 25 percent.	Moderate permeability when compacted; high piping hazard.	Slopes of 5 to 25 percent.	B
High	Low fertility	Unstable material.[1]	Moderately slow permeability; slopes of 0 to 50 percent.	Low permeability when compacted; high piping hazard; low stability.	Slopes of 0 to 50 percent; clay surface layer.	B
High	Low fertility; droughty; slides.	12 to 20 inches to bedrock.	Shallow to bedrock; slopes 50 to 100 percent.	Subsoil 40 percent gravel.	Slopes of 50 to 100 percent; rocky surface layer.	D
Medium	Low fertility; droughty; slides; stony.	Stones hinder hauling and grading.[1]	Moderately rapid permeability; slopes of 10 to 85 percent.	Moderate permeability when compacted, high piping hazard; moderate stability.	Slopes of 10 to 85 percent; gravelly surface layer.	B
Medium	Medium fertility	Moderate permeability.	Moderate permeability.	Low permeability when compacted.	Silt loam surface layer.	B
(2)	(2)	Unstable material	Steep, hummocky slopes; moderately slow permeability.	Moderate permeability when compacted; poor stability.	Clay surface, unstable, fair to poor surface drainage.	C

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of— Topsoil	Sand and gravel	Road fill	Road base materials	Need for road base stabilization
Landslides-Slickrock material: Ls	Poor: mixed material.	Not suitable: excessive fines.	Fair: A-5	(2)	(2)
Lint: LtD, LtE	Good	Not suitable: excessive fines.	Fair A-5	Poor	Medium
Loamy alluvial land. Lu	(2)	(2)	Fair A-4	Fair	Low
Marty: MaD, MaE, MrD	Fair: very strongly acid.	Not suitable: excessive fines.	Poor. A-7	Poor	Medium to high
Mulkey: MuD, MuF	Good	Not suitable: excessive fines; possible source of rock for crushing below a depth of 20 to 40 inches.	Fair A-4	Good	Low
Nehalem: Ne	Good	Not suitable. excessive fines.	Poor: A-6	Poor	Low
Nestucca: NsA, NsB	Fair: extremely acid or very strongly acid.	Not suitable: excessive fines.	Poor A-6	Poor	Medium to high
Preacher: PhD, PhE, PlF, PrD, PrE	Good	Not suitable: excessive fines	Poor A-7	Poor	Medium
Sandy alluvial land: Sa	(2)	(2)	Good: A-2	Good sand and gravel.	Low
*Skinner: SgE, SgF, SgG, SkF, SlE, SnF. For the Desolation part of SlE and SnF, see the Desolation series	Poor: 20 percent gravel	Not suitable excessive fines	Poor A-6	Good	Low

See footnotes at end of table.

interpretations—Continued

Slump and slide hazard	Soil features affecting— Cut and fill slope seedings	Road locations	Ponds: Reservoir areas	Ponds: Embankments	Winter grading	Hydrologic group
(2)	(2)	Unstable material	Steep, hummocky slopes, moderate permeability	Moderate permeability when compacted; moderate stability.	Gravelly surface, unstable, fair to poor surface drainage.	B
Medium	Low fertility, erodible.	Slopes of 3 to 37 percent.	Moderate permeability; slopes of 3 to 37 percent.	Moderate permeability when compacted; high piping hazard.	Slopes of 3 to 37 percent.	B
Low	Low fertility; droughty.	Subject to frequent overflow.	Rapid permeability.	Moderate permeability when compacted, high piping hazard.	Frequent overflow.	B
High	Low fertility	Unstable material [1].	Moderately slow permeability, slopes of 0 to 40 percent	Moderate permeability when compacted; moderate piping hazard, low stability.	Slopes of 0 to 40 percent	B
Low	Low fertility; erodible.	Bedrock below a depth of 20 to 40 inches.	Moderately rapid permeability, slopes of 5 to 50 percent.	High organic-matter content.	Slopes of 5 to 50 percent.	C
Medium	Low fertility	Subject to annual flooding	Moderate permeability.	Moderate permeability when compacted; moderate piping hazard.	Subject to winter flooding.	B
Medium	Low fertility	Seasonal high water table; subject to flooding during winter.	Moderately slow permeability; seasonal water table.	Low permeability when compacted, moderate piping hazard	High water table; subject to flooding during winter.	C
Medium	Low fertility	Slopes of 0 to 45 percent.	Moderate permeability; slopes of 0 to 45 percent.	Low permeability when compacted; moderate piping hazard, low stability.	Slopes of 0 to 45 percent.	B
Medium	Low fertility; droughty, erodible.	Subject to frequent overflow.	Not applicable	High permeability when compacted, low piping hazard; fair stability.	----------	B
Medium	Low fertility; stony.	Stones hinder hauling and grading [1], slopes of 5 to 75 percent.	Moderate permeability; slopes of 5 to 75 percent	Low permeability when compacted, moderate piping hazard, low stability.	Slopes of 5 to 75 percent; gravelly surface layer.	B

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—				Need for road base stabilization
	Topsoil	Sand and gravel	Road fill	Road base materials	
Slickrock: SoD, SrD, SsD, SsE, SsF, StE StF, SuE.	Fair: gravel in surface layer.	Not suitable: excessive fines.	Fair: A–5	Poor	Medium to high
Tidal marsh: Tm	Poor: massive clay.	Not suitable: excessive fines.	Poor. A–7		
Trask: TrG	Poor. 30 percent gravel; very steep.	Not suitable: excessive fines, gravel.	Good to fair: A–2 or A–4.	Poor	Low

[1] Topography may require cuts and fills.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 4 provide guidance about where to look for probable sources. A soil rated as a good or fair source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, and neither do they indicate quality of the deposit.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

In the column "Suitability as source of road base materials," the parent rock of each soil is rated for use in road construction. Properties considered are depth of overburden, rock hardness, and resistance to abrasion. Soils having a depth to parent rock of more than 5 feet are rated poor. Sandstone is soft and abrades easily, and therefore soils with this parent rock are rated poor. A rating of good is common for soils that formed in material weathered from basic igneous rock. Such rock is hard and resists abrasion.

The purpose of road base stabilization and surfacing is to provide a smooth surface over which vehicles can pass under all climatic conditions. Desirable properties that the subgrade should possess include strength, drainage, ease of compaction, permanency of compaction, and permanency of strength. Soil of the subgrade is a variable material and the interrelationships of soil mixture, density, moisture content, and strength are complex. Therefore, for design purposes, it is necessary to make a thorough study of soils in place and from this determine the design of the pavement. However, this soil survey gives much information about the individual soils, such as texture, available water capacity, density, stone content, and depth. Therefore, it provides considerable information for initial planning and choosing alternative road locations. This information, along with field observations of durability of the road pavements in the Alsea Area, serves as a basis for the ratings of the need for road base stabilization.

A rating of *low* means that a blanket of 8 to 12 inches is needed to stabilize the road base; *medium* means that a blanket of 12 to 20 inches is needed; and *high* means that a blanket of 20 to 30 inches is needed.

Some soils slump and slide more than others in deep cutbanks. The ratings for slump and slide hazard refer to the frequency and size of cutbank failures. Only failures of 5 cubic yards or more that occur during the first year following construction are considered. Failures that occur in the first year are likely to be followed by repeated failure in later years. A volume of 5 yards or more was chosen because it requires considerable time to remove with a road grader during routine road maintenance. Failures larger than this generally require scooping or tractor blading to clear the road and ditch. The frequency of failures may vary from these standards if the amount of precipitation varies markedly from normal. These interpretations were made on U.S. Forest Service roads designed to single lane, heavy duty and double lane, heavy duty standards or roads of equivalent design.

On soils having a *low* rating, there is no cutbank failure, or only one cutbank failure, per mile of roadway, during the first year following construction. On soils having a *high* rating, there are four or more failure per mile of roadway. Many of the failures on soils with a rating of high can be expected to be much larger than 5 cubic yards. Soils with a *medium* rating have two or three failures per roadway mile.

Where large areas of soil are exposed to erosion during road building, cut and fill slopes need to be seeded. Seeding grasses helps to control the erosion on some soils. Several kinds of soil features that affect the seeding

interpretations—Continued

Slump and slide hazard	Soil features affecting—					Hydrologic group
	Cut and fill slope seedings	Road locations	Ponds		Winter grading	
			Reservoir areas	Embankments		
High	Low fertility; slumps.	Unstable material [1]; slopes of 0 to 50 percent.	Moderate permeability; slopes of 0 to 50 percent.	Moderate permeability when compacted; high piping hazard, moderate stability.	Slopes of 0 to 50 percent; gravelly surface layer.	B
		Subject to tidal overflow.	Not applicable	Low permeability when compacted.		D
High	Low fertility; droughty; slides.	Slopes of 50 to 100 percent.	Shallow to bedrock; slopes of 50 to 100 percent.	High piping hazard.	Slopes of 50 to 100 percent; gravelly surface layer.	D

[2] Too variable for interpretations to be made; requires onsite investigations.

of cut and fill slopes are given in table 4. Low available nitrogen is a limitation in every soil and must be corrected for optimum growth of grass. A light application of phosphorus increases root development and winter hardiness (*20*). Light mulching of the cut and fill slopes helps to create a favorable microclimate until the seedlings are established, to prevent seed and fertilizer from rolling down sleep slopes, and to reduce erosion until the grass becomes established. Orchardgrass, timothy, alta fescue, perennial ryegrass, and velvetgrass are adapted to these soils and to this climate. Alta fescue generally persists after other grasses have died out (*11*).

Road locations are those of roads having a surface that is expected to carry logging trucks and automobiles during most of the year. These roads have a subgrade of crushed rock and soil material and a base consisting of gravel or crushed rock. They are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil material available at the site.

The main soil properties that affect design and construction of roads and streets are load-supporting capacity and stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHO and Unified classifications of the soil material, and also the shrink-swell potential, indicate load-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Reservoir areas of ponds hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Pond embankments are raised structures of soil material constructed across drainageways in order to impound water. These embankments are generally less than 20 feet high, are constructed of homogeneous soil material, and are compacted to medium density. Embankments having core and shell type construction are not rated in this table. The embankment foundation, reservoir area, and slope are assumed to be suitable for pond construction. Soil properties are considered that affect the embankment and the availability of borrow material. The best soils have good slope stability, low permeability, slight compressibility under load, and good resistance to piping and erosion. The best borrow material is free of stones or rocks and is thick enough for easy excavation.

If they are graded in winter when wet, different soils react differently to manipulation. Road grading can be done on some soils when they are very wet but not when they are dry. Soils that are plastic, fine textured, free of stones, and deep are difficult to grade. Their material may roll into clods, or the equipment may become mired. Roads without a base and subgrade course require almost annual maintenance in the form of grading.

HYDROLOGIC SOIL GROUPS

The soils of the Alsea Area have been placed in four hydrologic groups according to their ability to absorb water and according to the loss of water through runoff (*19*). The data are needed to estimate the total volume and peak rate of runoff from a rain of any given amount and intensity and are useful in planning water control measures.

The runoff potential of the soils in various hydrologic groups ranges from those that shed almost no precipitation (Group A) to those that shed nearly all the precipitation (Group D). Texture and depth are good indicators of the absorptive capacity of a soil, but they may not always determine the group in which a soil is placed. Other factors must also be considered in grouping a soil.

The four hydrologic groups are described as follows:

Group A. Low runoff potential. Soils having high (rapid) infiltration rates even when thoroughly wetted and consisting chiefly of deep, well-drained to excessively

drained sands or gravel. These soils have a high rate of water transmission.

Group B. Moderately low runoff potential. Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well drained to well drained soils with moderately fine to moderately coarse textures and moderately rapid to moderately slow permeability. These soils have a moderate rate of water transmission. Included with this group are fine-textured soils with moderately slow permeability. Also included are soils with weathered or fractured bedrock.

Group C. Moderately high runoff potential. Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of (1) moderately deep soils with bedrock that impedes the downward movement of water, (2) soils with moderately fine to fine texture and a slow infiltration rate, (3) soils with a moderate water table (those soils may be somewhat poorly drained), and (4) clay soils with slow or very slow permeability. These soils have a slow rate of water transmission.

Group D. High runoff potential. Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of (1) clay soils with a high swelling potential, (2) soils with a high permanent water table, (3) soils with a claypan or clay layer at or near the surface, and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission.

Formation, Morphology, and Classification of the Soils

This section describes the major factors that have affected the formation of the soils in the Alsea Area. Next, it discusses the morphology of the soils. Finally, it describes the current system of classification and places each soil series in some of the higher categories of that system.

Factors of Soil Formation

Soils are natural bodies on the surface of the earth. Soil properties at any given place reflect the interaction of five factors: (1) the climate under which the soil material has existed; (2) living organisms, primarily vegetation; (3) the physical and mineralogic composition of the soil parent material; (4) topography or relief; and (5) the length of time the processes of soil development have been acting on the parent material. Each of the factors consists of several elements and may act in innumerable combinations. The importance of the individual factors differs from place to place. Climate, for example, includes annual, seasonal, and geographic distribution of precipitation, temperature, wind, and amount of sunshine. Topography and time, parent material and topography, and climate and living organisms are each interrelated.

Climate

Climate of three subareas within the Alsea Area is discussed briefly in the section "General Nature of the Area." These subareas have differences in total precipitation, average annual temperature, and amount of sunshine. These climatic factors influence soil formation by determining the amount of water available for leaching of the bases and rock weathering, and the temperature at which soil chemical reactions take place. Differences in native vegetation and other living organisms also may be related to climate.

The climatic subarea around Alsea is characterized by moderate annual fluctuations in air temperature and corresponding similar variations in soil temperature. Annual precipitation is moderate. Evaporation is high because of the warm temperature and large number of cloud-free and fog-free days. The soils of this subarea are the coolest in winter and the warmest in summer. These soils seldom freeze. The small amount of summer precipitation, when vegetative and evaporative uses are greatest, nearly precludes leaching during that season. Soils of this subarea generally are dry late in summer. Most of the Ultisols are in this climatic subarea.

The Tidewater climatic subarea is characterized by low to moderate annual fluctuations in air temperature. Precipitation is high and evaporation is moderate because of generally cool temperatures and numerous foggy or cloudy days. Sufficient water is available for genetic processes to continue all year. However, most leaching occurs in fall, winter, and spring. Most soils in this area are Inceptisols.

In general, the soils of the Alsea and the Tidewater climatic subareas have greatly different base saturation. Digger soils in the drier climatic area near Alsea have high base saturation, possibly suggesting that leaching is not effective (see table 6, p. 70). Bohannon soil in the Tidewater climatic subarea have low base saturation, suggesting an effective leaching condition (see table 6). However, soil studies in the Coast Range (*12*) also indicate that the downslope movement of base-rich ground water increases the base saturation of soils that are on lower parts of slopes when compared with the soils upslope.

The Waldport climatic subarea has low annual and diurnal fluctuations of air temperature because of the moderating effect of the ocean. The amount of precipitation is similar in the Waldport and the Alsea subareas. However, the number of days of sunshine is limited in the Waldport subarea because of fog and clouds. Water is readily available for leaching since evaporation and transpiration consume considerably less soil moisture than in the Alsea and Tidewater subareas. Soils of the Waldport subarea have small annual temperature fluctuations and are strongly leached. Most of the soils in this subarea are Inceptisols.

Vegetation

Differences in vegetative cover influence many soil properties. Vegetation affects soil formation by determining (a) the kind, amount, and placement of organic materials added to the soil; (b) nutrient recycling; and (c) the erosion protection provided for the soil surface. The kind of vegetation determines in part the kind, amount, and distribution of organic matter in solids and, thus, the kind and amount of soluble organic compounds involved in leaching and rock fragment weathering. Elements are removed from the soil profile by the downward movement

of soil moisture, or they may be absorbed by plant roots. Absorption by plants is particularly important in the Alsea Area where the leaching potential is very high.

Plants provide protection from compaction, erosion, and soil heating. The canopy intercepts small raindrops, which coalesce to form larger drops having greater energy. If the canopy is high, the impact of the enlarged raindrops may be great. This is particularly true of fog drip. Grass and low shrubs and herbs, growing as understory or without the canopy, practically eliminate the erosive effect of falling rain. Stem flow is an important means of water reaching the soil under grass and shrubs. Soil temperature is affected by canopy shading, and it also is influenced by the organic materials on the soil surface. An organic mulch, composed of needle litter, insulates the soil and tends to keep soil temperature relatively constant, thus reducing evaporation. Soils lacking an organic mulch are warmed and dried if sunlight penetrates the vegetative canopy.

Accelerated erosion generally is not important if there is an organic layer over the mineral soil. The organic material protects the soil from detachment, raindrop impact, and surface flow of water. Many of the soils have strong surface structure and high infiltration rates that exceed the slow rate of rainfall. However, serious erosion occurs where the organic surface layer has been destroyed or the soil porosity has been reduced by compaction.

Salt-marsh vegetation produces a dense mat of roots and stolons. A large amount of organic material is added by this vegetation. Conditions for the decomposition of organic matter are unfavorable because of flooding by brackish water, a high salt content, and a cool, wet climate. Clatsop soils have the highest organic-matter content of soils in the Alsea Area. They also have a high content of soluble salts and sulfides. The salt content in the surface layer is maintained by a combination of inundation in winter and upward movement of salts by capillary rise in summer. The salt content decreases during fall and spring months of heavy rainfall.

The greatest concentrations of sulfides occur in fragments of preserved organic debris, such as cattails (*Typha* spp.) buried at depths of 1 foot or more in gleyed, fine-textured mineral soils. The soil pH markedly changes from 5.0 or 6.0 before exposure to air to 3.0 after exposure. This change is probably due to the oxidation of sulfides to sulfates with the subsequent production of sulfuric acid. The odor of hydrogen sulfide is strong in excavations of Clatsop soils.

Sedge-grass-fern vegetation, which is always associated with Mulkey soils, adds a large amount of organic material to the soil. Much of the organic matter is derived from roots and therefore is less subject to oxidation than litter deposited on the surface. The cool temperatures and winter snowpack also inhibit the decomposition of organic matter. Mulkey soils have low base saturation and narrow ratios between calcium and magnesium.

Parent material

The processes that sculpture the earth's surface have been very active in most of the Alsea Area. The rocks in the Area are of igneous and sedimentary origin and differ markedly in structure and chemical composition.

A generalized map showing the distribution of sedimentary and igneous rocks in the Alsea Area is shown in figure 7. Two kinds of sedimentary rocks, shale and arkosic sandstone, are dominant (*3*). Arkosic sandstone occupies about three-fourths of the acreage and occurs in thick layers that are alternately bedded with thin, continuous strata of shale (fig. 8). The largest area of shale bedrock is immediately inland from the coastal sand dunes.

Three kinds of igneous rocks are in the Alsea Area. They are extrusive basalt and intrusive gabbro or diorite and nepheline syenite. The basalt is greenish gray and contains abundant radiating zeolite crystals (*3*).

All kinds of bedrock in the Alsea Area are subject to weathering to some degree because of the relatively high precipitation and mild temperatures. Sandstone and shale are most easily weathered, the intrusive rocks are slowest to weather, and the basalt is intermediate.

Most of the rocks have a wide range of minerals. The igneous rocks range from basic to acid (basalt to nepheline syenite). The soils derived from basalt and gabbro or diorite generally have higher base saturation than soils derived from nepheline syenite. Much of the clay present in the soils derived from shale was present as clay in the rock. As a result, soils derived from shale contain considerably more clay than soils derived from sandstone, which is a sedimentary rock low in clay.

The alluvium has mixed mineralogy because, in most places, it was derived from several kinds of rock in the Area. Except for tidal flats, the older alluvium on high terraces generally is finer textured than the alluvium along streams or in narrow valleys of tributary streams. Alluvial fans with low slope gradients generally are the finest textured. The alluvium in these fans commonly is stratified with lenses of sand and gravel interbedded with finer textured sediments. The dune and beach sand probably is derived mainly from the arkosic sandstone or nepheline syenite.

The sandy material may be of local origin or may have been transported along the coast from other drainages. Sorting and attrition by wind and waves have left a narrow range of particle sizes. These particles consist mostly of resistant minerals such as quartz.

The nature of parent material depends on the mineralogy of the parent rock and the degree to which the rock has been weathered and transported. Weathering and transportation are related to geologic structure, climate, and such geologic events as uplift, faulting, erosion, and deposition.

Landscape position and surface shape are distinctive for some kinds of parent material. The parent materials that were derived from bedrock are residuum and alluvium-colluvium. Residuum, which weathered in place from the bedrock, occurs generally on gently sloping ridges. Alluvial and colluvial materials occur on sloping to steep slopes and have been transported downslope by both water and gravity. The parent materials on the flood plains, terraces, fans, and tidal flats were transported and deposited by water and generally have smooth, gentle slopes. Sandy materials along the coast were transported and sorted by wind and water. The relief is mostly smooth, but some low sand dunes are present.

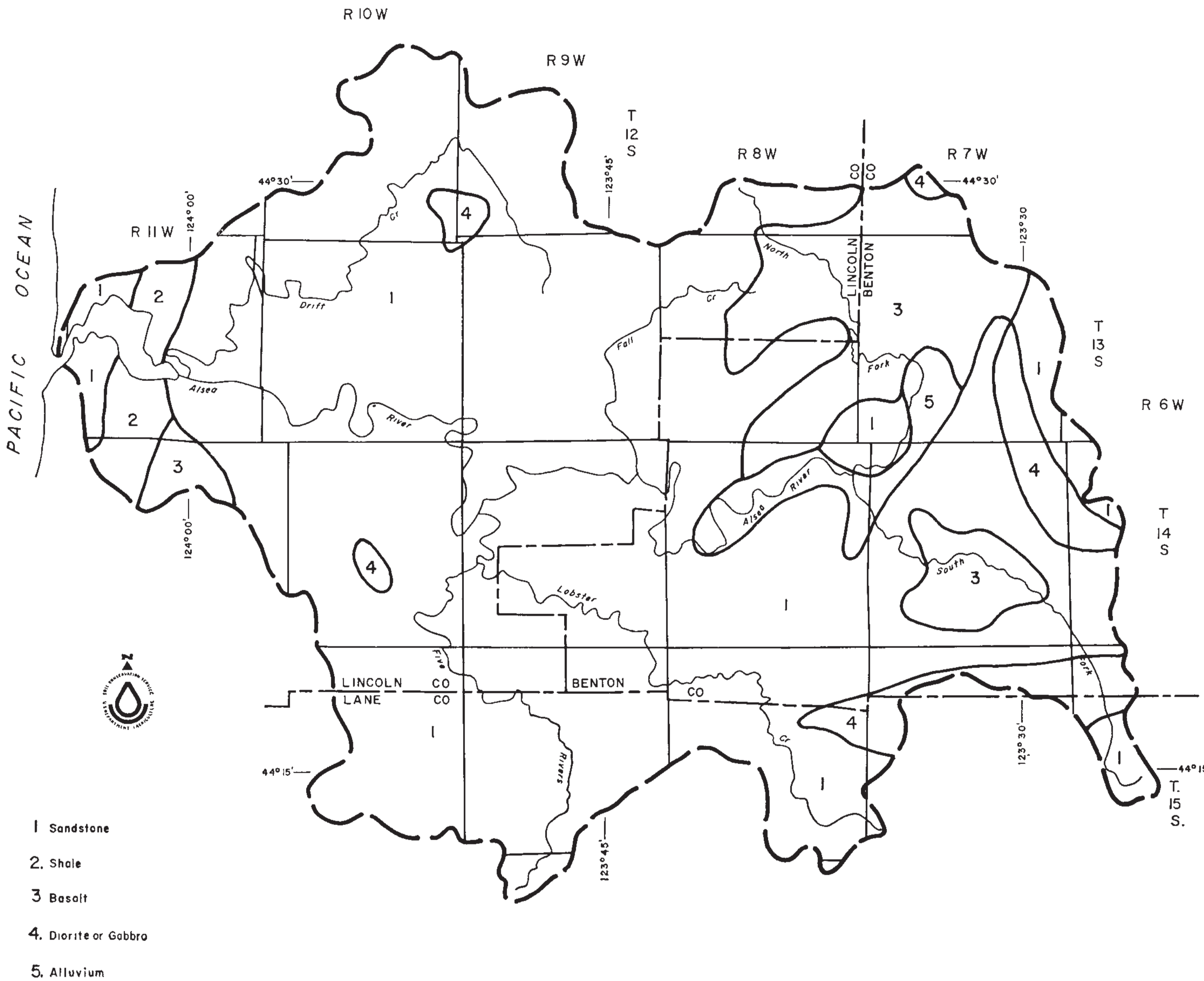

Figure 7.—**Types of rock in the Alsea Area.**

Topography

The varied landscapes in the Alsea Area reflect differences in the parent rock, in the kind and degree of drainage-pattern development, and in the form and extent of certain landforms. Recognition of the morphology and genesis of landforms is essential because there is a close relationship between the underlying rock, the land surface configuration, and the nature and distribution of soils.

The extremes in elevation within the survey area range from sea level at Waldport to 4,097 feet at Marys Peak. In areas of sandstone, the greatest relief is about 1,500 feet in the area south of Table Mountain and northwest of Grass Mountain. Near the town of Alsea, the least relief is about 500 feet and has short, steep slopes and several drainageways and ridges in each square mile. In areas of basalt bedrock, the average relief within a square mile is about 900 feet. Slopes generally are long and smooth and have an average of one drainageway and one ridge per square mile. In the area of coastal terraces adjacent to the ocean, relief is only about 250 feet. The ridges are smooth and gently convex.

The arkosic sandstone formation generally slopes gently to the west but locally may dip in any direction due to faulting. Areas of sandstone generally have dendritic drainage patterns with high density. Valleys are narrow and steep sided. Two distinctive geomorphic features characterize the sandstone area. They are the cuesta face and the back slope (fig. 9). These landforms, the degree of drainage development, and the nature of soils are related to the stratification and dip of the sedimentary rock. Streams undercut the stratified sedimentary rock of cuesta faces but cut very slowly through the strata of the back slopes. Cuesta faces thus have steeper slopes, thinner soils, and higher drainage density than back slopes (fig. 9). The area of shale near the coast has similar geologic-landform-soil relations.

Figure 8.—**Interbedded sandstone and shale typical of most of the Alsea Area.**

The basalt is highly fractured and faulted in most places. The shape of the land surface is related to the degree of fracturing and faulting. Smooth surfaces generally overlie basalt having few faults and fractures. Undulating surfaces are characteristic of the faulted and fractured areas and of those areas with interbeds of tuffaceous sediments. In contrast to the sandstone area, the drainage system has a lattice-dendritic pattern with lower density. Valley slopes are long and smooth and contain few incised drainageways.

The intrusive igneous rocks occur as dikes or sills, and as caps on most major peaks. Originally emplaced beneath easily eroded sediments, these resistant rocks subsequently have been exposed and now cap Marys, Green, Buck, and Prairie Peaks, and Grass, Flat, Cannibal, and Table Mountains. Because of their resistance to erosion, most outcrops of intrusive igneous rocks are on steep slopes, and therefore soils derived from them are steep and shallow and contain many coarse fragments.

The number of drainageways in each soil area is significant to engineers, foresters, and loggers. Distinctive land surface configurations or landforms were noted. These are uneven, dissected uneven, and dissected slopes; ridge, slump, bench, headwall, landslides, and terrace landforms. Benchlands, headwalls, and some ridges are indicated on the soil maps by symbols. Two of the landforms, bench and headwall, always occur together. A cross section of this landform combination is shown in figure 10. A bench is situated downslope from the headwall or slump "scar" and is composed of basin, lip, and toe. In most places the bench is a result of faulting. Smooth and uneven slopes and ridges are also shown in figure 10.

Slope is the basis of many soil separations and has a strong influence on the ease of detachability and the downslope movement of soil particles. It is also closely related to soil age. Generally, old soils are not steep. Steep soils normally are subject to continual erosion. Soil material is removed slowly by erosion or suddenly by landslides. Ground surfaces, therefore, are continually being rejuvenated. Conversely, soils having broad, relatively stable slopes commonly have resulted from long periods of continuous action by soil-forming processes. Erosion losses have been slight, and the soils commonly are deeply leached and strongly developed.

Water is collected and retained in the soils of some areas so that soil moisture is high during much of the year. The amount of water collected and retained is largely determined by the shape of the land surface. Nearly level to gently slopping concave areas generally are wetter than areas that are steep and convex. These areas occur primarily on terraces, and on uneven slopes,

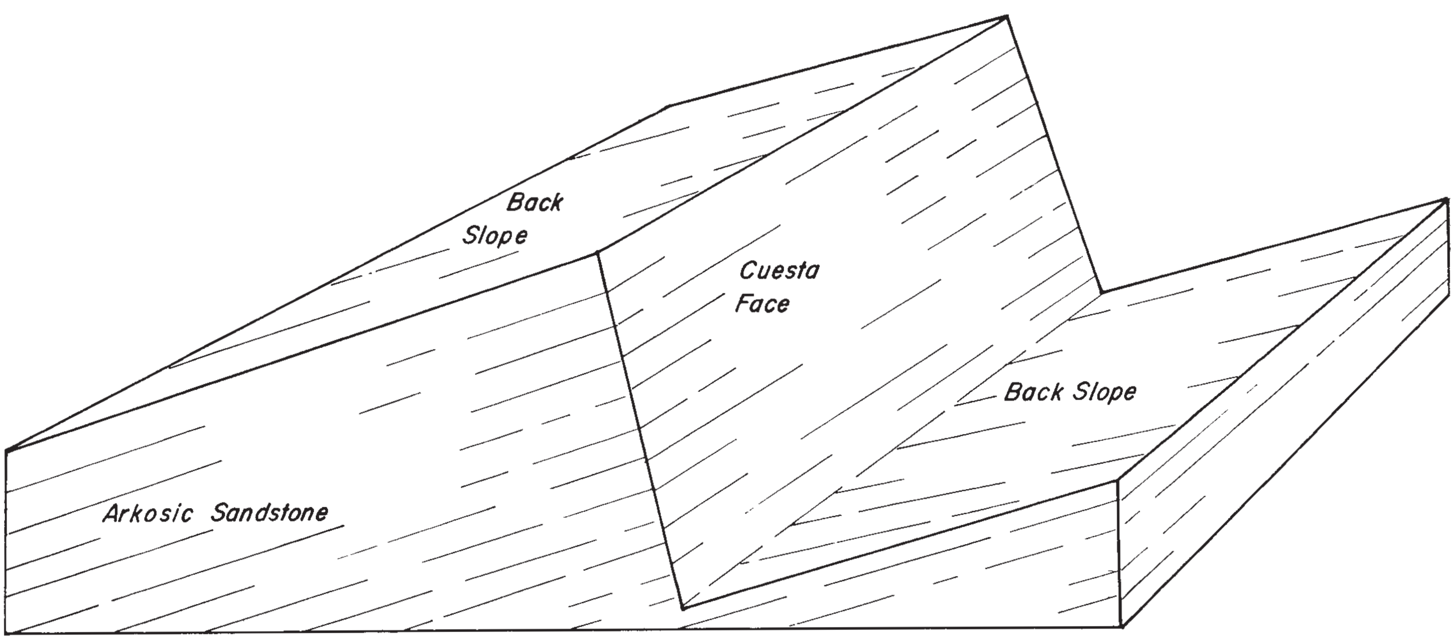

Figure 9.—**Cuesta face and back slope of dipping arkosic sandstone bedrock.**

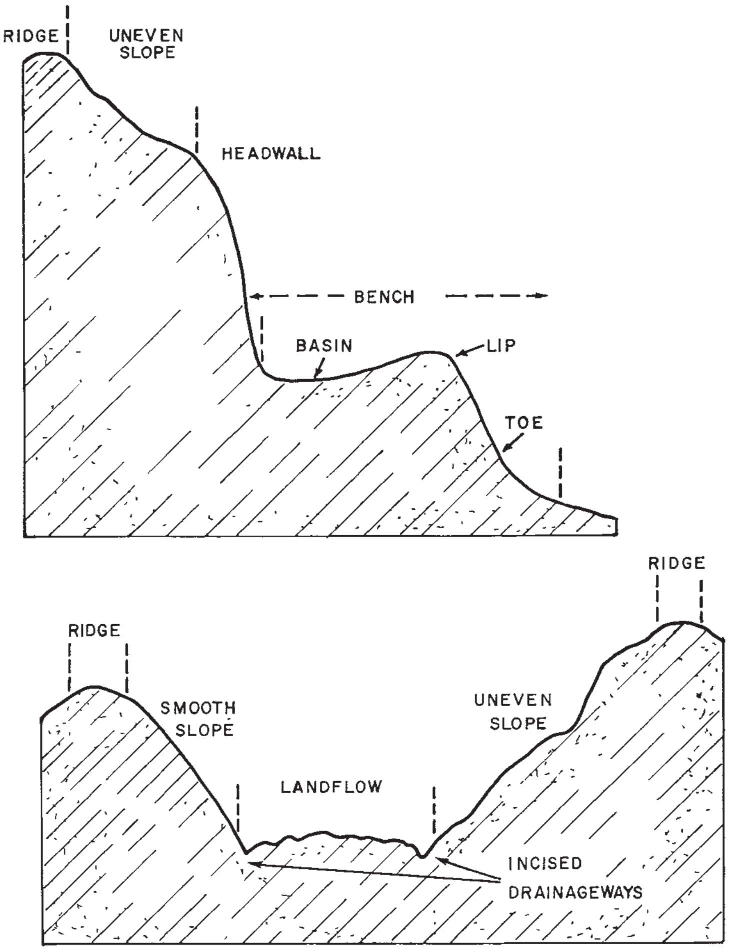

Figure 10.—**Diagram showing a cross section of six landforms.**

benches, or seeped areas of the uplands. Most of the soils on these landforms are wet because of topographic shape and position instead of slow subsoil permeability. The soils of flood plains and tidal marshes are wet mainly because of their relatively low elevation in relation to rivers, streams, and oceans.

Time

A period of time is necessary for soil development. Young soils generally show little modification from the parent material. Increasing soil age tends to obscure soil differences inherited from diverse parent materials, thus making them less significant.

In general, gently sloping soils on uplands have not been subjected to severe geologic erosion and are more developed than soils having steep slopes. Young, weakly developed soils are commonly formed in recent alluvium. Soils on the steep side slopes of terrace escarpments are weakly developed because of erosion. However, the parent material may be fairly old alluvium.

Alluvium is the most recent geologic material deposited. These materials are on river bottoms and terraces. They are unconsolidated silt loams, loams, and loamy sands that are nearly level to gently sloping. Soils such as the Alsea and Nestucca that developed in the alluvium in Holocene flood plains in the Coast Range are as young as 655 to 455 years (*4*).

Time is involved in many interactions with other factors, and therefore its effect is variable. Parent materials of different texture and mineralogy may be modified to very different profiles in the same period of time. For example, beach sands composed mainly of quartz are weathered very slowly and may have soils that are little different from the parent material. Conversely, in the same length of time, the soils that developed from easily weathered minerals may have a much finer texture, stronger structure, and different colors than the parent material.

The time factor also is related to mineral weathering before the present cycle of soil formation. For example, landslides may destroy an area of residual soils. The older soil materials may be mixed with unweathered rock and horizons completely destroyed by the landslide. The old soil, with a mixture of fresh rock and minerals, becomes parent material for a new cycle of soil formation. This mixture may be much different from the original soil material in depth, color, rock content, type and content of clay, and organic-matter content. From the beginning of soil formation following movement, this material may give rise to a soil that has different properties instead of a residual soil formed in the initial parent material. Soils that developed in slopewash or valley fill derived from weathered materials transported from a position upslope may have, for instance, an initially low base saturation.

Honeygrove soils with a red clay Bt horizon that occur on stable ridges in the Coast Range are at least 9,570 years old (*4*). Local differences in soil age and soil development are expected where landscapes are relatively unstable, as in the Alsea Area.

Morphology of the Soils

Soils of the Alsea Area have been formed by physical, chemical, and biological processes acting upon parent material over a period of time. These processes have acted upon the parent materials with varying intensity. Information about soil genesis is obtained by studying soil characteristics that have resulted from these processes. In the Alsea Area, some of the important soil features that have been derived from genetic processes are: (1) mixed soil material; (2) low base saturation; (3) low bulk density and high porosity; and (4) red, gray, and mottled colors.

Mixed soil materials.—Most of the soils on uplands of the Alsea Area formed in alluvial and colluvial materials that have been transported. For soils having uneven slopes, the shape of the land surface and variable depth to bedrock suggest past movement. However, two kinds of soil formation are on the uneven landforms. Honeygrove soils are red, are high in clay content, and have few weatherable minerals in the subsoil. Honeygrove soils formed on relatively old, stable surfaces. The Slickrock soils formed on younger, less stable surfaces, contain less clay, and lack horizons of clay illuviation. Blachly soils may have formed in previously weathered materials. The material in the A horizon has been more recently transported and contains fresh grains of weatherable minerals. Stone lines indicate lithologic discontinuities in some profiles and represent lag concentrates on old erosion sur-

faces. Discontinuities commonly occur between the A and B horizons.

Low base saturation.—Most soils of the Alsea Area have low base saturation (see table 6). Leaching has been intense because of the high precipitation, mild temperatures, high permeability, and good drainage. Nutrient cycling by plants has been only moderately effective in preventing the loss of bases.

Leaching in this survey area is closely related to soil age. In general, older soils that occur on more stable geomorphic surfaces are more completely leached. The soils that formed in Holocene alluvium on flood plains have higher base saturation than soils on terraces, because floods have added fresh soil material at frequent intervals. Soils on terraces are no longer subject to periodic inundation. The youthful upland soils on unstable landscapes, such as Digger and Bohannon soils, have higher base saturation than older soils, such as the Honeygrove and Blachly.

Base saturation also may be related to the nature of the parent material. For example, the igneous rocks of the Alsea Area that are listed in order of increasing acidity (increasing quartz and decreasing iron-magnesium minerals) are basalt, diorite, and nepheline syenite. Base saturation is highest in Blachly soils, basalt substratum, intermediate in Marty soils derived from diorite, and lowest in Bohannon soils, syenite substratum.

Low bulk density and high porosity.—High porosity and low bulk density are characteristic of most soils of the Alsea Area. These soils also tend to be softer and more friable than many soils having similar clay contents in other parts of Oregon. These characteristics occur in both the A and B horizons and, therefore, are not entirely due to a high content of organic matter. The high porosity may be related to such disruptive factors as the large number and rapid growth of roots, the frequency of tree throw, and the activity of burrowing animals. Allophane in the clay fraction may also also be related to the low bulk density.

Red, gray, and mottled colors.—Most of the soils on uplands have a yellowish or reddish subsoil. Red colors are related to the iron-oxide concentration and the degree of iron oxidation in the soil. Iron oxides result from weathering of iron-bearing minerals over a long period of time. This is probably the reason for the intense red colors (2.5YR) in old soils, such as Blachly and Honeygrove, derived from sandstone, and for less red colors (7.5YR to 10YR) in young soils, such as Bohannon and Digger that developed from the same parent rock. This conclusion is supported by mineralogic data (*15*) which indicate that there are fewer weathered iron-rich minerals, such as amphiboles and pyroxenes, and a greater accumulation of resistant minerals, such as zircon, rutile, and tourmaline, in the older subsoils.

Soils derived from parent materials that have a high content of iron-rich weatherable minerals quickly become red. Young soils, such as the Hatchery and Klickitat soils derived from basalt, are quite red (5YR), but soils of similar age derived from sandstone, such as the Digger and Bohannon, are more yellow (7.5YR to 10YR).

Mottled and gray colors are most common in the soils that have impeded drainage and formed in alluvium. These soils have gray colors mixed with spots of brown, yellow, or olive. Because of the flat land surface and the lack of suitable drainage outlets for percolating water, these soils are waterlogged for long periods each year. The amount of oxygen dissolved in the water becomes very low. In the presence of reducing agents such as organic matter, ferric (iron) oxides are reduced to ferrous forms. Ferric oxides are red or yellow, but ferrous forms generally are green or blue. Ferric oxides are water insoluble, but ferrous oxides are water soluble and move in the soil water. Wet soils with gray colors having low chromas have been depleted of iron compounds.

Ferric-oxide mottles occur in areas of the soil profile that have an aerated water table. Ferrous-oxide mottles normally are deeper in the profile where the ground water contains less oxygen. The former can be attributed to fluctuations in the water table, but the latter to a more nearly permanent water table. In poorly drained soils, such as Hebo, the gray matrix is due to the removal of iron.

Soils on uplands generally do not show distinct evidence of impeded drainage. During the winter, soils in flat areas or depressions may be waterlogged or extremely wet, but oxygen-saturated water readily moves into, through, and away from the profile. Soil moisture probably does not become sufficiently oxygen depleted to induce intense reduction of iron compounds.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The current system of classification was adopted for general use by the National Cooperative Soil Survey in 1965 (*21*). It is under continual study (*17*). Therefore, readers interested in developments of the current system should search the latest literature available. In table 5 the soil series of the Alsea Area are placed in some categories of the current system.

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. The six categories are discussed in the following paragraphs. Then the soil series in the Alsea Area are described by subgroups.

ORDER: Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols. Alfisols. Ultisols, and Histosols. The properties used to differentiate these soil orders are those that tend to give broad climatic groupings of soils. Two exceptions,

TABLE 5.—*Classification of soil series*

Soil Series	Family	Subgroup	Suborder	Order
Alsea	Fine-loamy, mixed, mesic	Cumulic Hapludolls	Udolls	Mollisols.
Apt	Clayey, mixed, mesic	Typic Haplohumults	Humults	Ultisols.
Astoria	Fine, mixed, mesic	Andic Haplumbrepts	Umbrepts	Inceptisols.
Blachly	Fine, mixed, mesic	Typic Dystrochrepts	Ochrepts	Inceptisols
Bohannon	Fine-loamy, mixed, mesic	Typic Haplumbrepts	Umbrepts	Inceptisols.
Brenner [1]	Fine, mixed, acid, mesic	Fluventic Humaquepts	Aquepts	Inceptisols.
Chitwood	Clayey, mixed, mesic	Aquic Haplohumults	Humults	Ultisols.
Clatsop	Fine, mixed, acid, mesic	Histic Humaquepts	Aquepts	Inceptisols.
Depoe	Fine-loamy, mixed, mesic, ortstein	Typic Sideraquods	Aquods	Spodosols.
Desolation	Fine, mixed, mesic	Typic Dystrochrepts	Ochrepts	Inceptisols.
Digger	Loamy-skeletal, mixed, mesic	Dystric Eutrochrepts	Ochrepts	Inceptisols.
Fendall	Fine, mixed, mesic	Typic Haplumbrepts	Umbrepts	Inceptisols.
Ferrelo	Coarse-loamy, mixed, mesic	Typic Haplumbrepts	Umbrepts	Inceptisols.
Hatchery	Loamy-skeletal, mixed, mesic	Dystric Eutrochrepts	Ochrepts	Inceptisols.
Hebo	Clayey, mixed, mesic	Typic Umbraquults	Aquults	Ultisols.
Hembre	Fine-loamy, mixed, mesic	Typic Haplumbrepts	Umbrepts	Inceptisols.
Honeygrove	Clayey, mixed, mesic	Typic Haplohumults	Humults	Ultisols.
Honeygrove, heavy variant.	Clayey, mixed, mesic	Typic Haplohumults	Humults	Ultisols.
Kilchis	Loamy-skeletal, mixed, mesic	Lithic Haplumbrepts	Umbrepts	Inceptisols.
Klickitat	Loamy-skeletal, mixed, mesic	Typic Haplumbrepts	Umbrepts	Inceptisols.
Knappa	Fine-silty, mixed, mesic	Pachic Haplumbrepts	Umbrepts	Inceptisols.
Lint	Fine-silty, mixed, mesic	Typic Haplumbrepts	Umbrepts	Inceptisols.
Marty	Fine-loamy, mixed, mesic	Andic Dystrochrepts	Ochrepts	Inceptisols.
Mulkey	Medial, frigid	Typic Dystrandepts	Andepts	Inceptisols.
Nehalem [2]	Fine-silty, mixed, mesic	Fluventic Haplumbrepts	Umbrepts	Inceptisols.
Nestucca	Fine-silty, mixed, acid, mesic	Fluventic Humaquepts	Aquepts	Inceptisols.
Preacher	Fine-loamy, mixed, mesic	Typic Haplumbrepts	Umbrepts	Inceptisols.
Skinner	Fine-loamy, mixed, mesic	Typic Dystrochrepts	Ochrepts	Inceptisols.
Slickrock	Fine-loamy, mixed, mesic	Pachic Haplumbrepts	Umbrepts	Inceptisols.
Trask [3]	Loamy-skeletal, mixed, mesic	Umbric Dystrochrepts	Ochrepts	Inceptiosls.

[1] The surface horizon of the Brenner soils in the Alsea Area is somewhat thicker than the defined range for the series, and these soils are considered as a taxadjunct to the Brenner series.
[2] The surface horizon of the Nehalem soils in the Alsea Area is somewhat thicker than the defined range for the series, and these soils are considered as a taxadjunct to the Nehalem series.
[3] Trask soils in the Alsea Area are shallower than 20 inches, which is shallower than the defined range for the series, and these soils are considered as a taxadjunct to the Trask series.

the Entisols and Histosols, occur in many different kinds of climate. The four orders recognized in the Alsea Area are Inceptisols, Mollisols, Spodosols, and Ultisols.

Inceptisols are soils with diagnostic horizons that are believed to develop in a short period of time and that do not represent significant eluviation, illuviation, or intense weathering. Astoria and Blachly soils are representative of Inceptisols.

Mollisols have a dark-colored mineral surface horizon and may or may not exhibit evidences of clay illuviation. Base saturation values are more than 50 percent throughout the solum. Alsea soils are the only Mollisols in the Alsea Area.

Spodosols are mineral soils with light-colored eluvial horizons over illuvial horizons that have been enriched by appreciable quantities of organic carbon and aluminum, with or without iron. Spodosols generally develop in coarse-textured (sandy) materials. The Depoe soils are the only Spodosols recognized in the Alsea Area.

Ultisols are mineral soils that have distinct horizons. The B horizons are enriched by illuviated clay and have low base saturation that decreases with increasing depth. Apt, Chitwood, Hebo, and Honeygrove soils represent this order in the Alsea Area.

SUBORDER: Each order is subdivided into suborders, primarily on the basis of soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders have a narrower climatic range than the orders. The criteria for suborders mainly reflect the presence or absence of water-logging or soil characteristics that result from climatic or vegetational differences. An example is the Humults in the order Ultisols.

GREAT GROUP: The suborders are divided into great groups on the basis of uniformity in the kinds and sequences of major soil horizons and other features. The horizons used as a basis for separating great groups are those in which clay, iron or aluminum, or humus has accumulated. Among the soil features that serve as the criteria for distinguishing between great groups are temperature and moisture content. Major differences in chemical composition, primarily calcium, magnesium, potassium, and sodium, are also used as criteria for great groups. The great group is not listed in table 5, because the name of the great group is the same as the last word in the name of the subgroup. An example of a great group is Haplohumults.

SUBGROUP: Each great group is divided into subgroups. One of the subgroups represents the central, or typic, segment of the group. Other subgroups, called intergrades, have properties that are primarily of the great group, but they also have one or more properties of another great group, suborder, or order. The names of subgroups are formed by placing one or more adjectives before the name of the great group. An example is Typic

Haplohumult—a "typical" Haplohumult. An Aquic Haplohumult is not typical but has somewhat restricted internal drainage.

FAMILY: Subgroups are divided into families primarily on the basis of properties important to plant growth or soil behavior for engineering. Some soil properties used as family criteria are texture, mineralogy, reaction, soil temperature, thickness of horizons, and consistence. An example is the clayey, mixed, mesic family of Typic Haplohumults.

SERIES: Soil series consist of a group of soils that are assumed to have formed in a particular kind of parent material and have genetic horizons that are similar in differentiating characteristics and in arrangement in the profile. Among these characteristics are color, structure, reaction, consistence, and mineralogical and chemical composition.

Soils series are named for a town, county, or other geographic location, generally where that particular soil was first recognized. Astoria and Clatsop are names of soil series that occur in the Alsea Area.

During the soil survey program in the United States, new soil series must be established as more information about soils becomes available. Concepts of some established series, particularly older ones that have been used little in recent years, must be revised. A newly proposed series has tentative status until study of the series concept at National, State, and regional levels of responsibility for soil classification results in a decision that the new series should be given established status.

Descriptions of soil series by subgroups

A discussion of soil series in the Alsea Area by subgroups is given in this section.

Typic Dystrandepts.—The Mulkey soils are in this subgroup. These soils are well drained. The surface horizons have a bulk density of the fine earth fraction of less than 8.5 grams per cubic centimeter, and the exchange complex mainly is amorphous material. The average annual soil temperature is at least 47° F. The soils have a dark-colored horizon at least 10 inches thick. The 15-bar water retention is 20 percent or more based on the average for the whole soil between 10 inches and the lithic contact. The cation exchange capacity is more than 30 milliequivalents per 100 grams of soil in all horizons above the lithic contact.

Fluventic Humaquepts.—The Brenner and Nestucca soils are in this subgroup. They are poorly drained or somewhat poorly drained, moderately fine textured or fine textured soils that developed in swales in flood plains. These dark-colored soils are low in chroma, and base saturation is less than 50 percent in the upper 4 feet. The organic-matter content is high and does not increase regularly with depth, since the soils are on recent geomorphic surfaces that are still subject to inundation. The Brenner soils as they occur in the Alsea Area have a thicker mollic epipedon than is normal.

Histic Humaquepts.—The Clatsop soils are in this subgroup. They are very poorly drained, moderately fine textured or fine textured, strongly acid soils that developed in alluvium deposited in the quiet water of coastal bays. They have an organic surface horizon, are dark-colored mineral soils that are low in chroma, and contain distinct or prominent mottles. Unless some areas of these soils are protected by dikes in winter, they are subject to tidal overflow during storms and high tides.

Typic Dystrochrepts.—The Blachly, Desolation, and Skinner soils are in this subgroup. They are well-drained soils with base saturation of less than 60 percent, moist chromas of at least 4 within 10 inches of the surface, and no evidence of clay illuviation. These soils overlie basalt or sedimentary bedrock, which occurs at a depth of 40 inches or more.

Andic Dystrochrepts.—The Marty soils are in this subgroup. They are well-drained soils. The B horizon lacks evidence of clay illuviation, has base saturation of less than 60 percent, and has chromas of at least 4 within 10 inches of the surface. Marty soils have low bulk densities and are thought to contain amorphous colloidal material weathered from volcanic ash. Depth to bedrock is 5 to 8 feet.

Umbric Dystrochrepts.—The Trask soils are in this subgroup. They are well-drained soils that have base saturation of less than 60 percent and show no evidence of clay illuviation. They have a chroma of 3 or 4 within 10 inches of the surface. The Trask soils as they occur in the Alsea Area are shallower than 20 inches, which is shallower than the defined range for the series.

Dystric Eutrochrepts.—The Digger and Hatchery soils are in this subgroup. These soils are well drained and are medium or moderately fine textured. Bedrock occurs at a depth of 20 to 40 inches. The A horizon is thin and dark colored. The B horizon lacks evidence of clay illuviation and has base saturation of at least 60 percent in some subhorizons within 30 inches of the soil surface.

Typic Haplumbrepts.—The Bohannon, Fendall, Ferrelo, Hembre, Klickitat, Lint, and Preacher soils are in this subgroup. These soils are well drained and overlie basalt or sedimentary rocks at a depth greater than 20 inches. The average annual soil temperature is somewhat greater than 47° F. The A horizon is dark in color and is less than 20 inches thick. They have moist chromas of 3 or less and base saturation of less than 50 percent. The B horizon has no significant evidence of clay illuviation.

Andic Haplumbrepts.—The Astoria soils are in this subgroup. These soils are well drained, have a dark-colored, acid A horizon that is 10 to 20 inches thick, and contain moist chromas of 3 or less. The surface horizon has low bulk densities and contains amorphous colloidal materials. There is no evidence of clay illuviation, and the base saturation is low throughout the solum.

Fluventic Haplumbrepts.—The Nehalem soils are in this subgroup. In the Alsea Area they are well-drained silt loams that have a thicker, dark-colored epipedon than is normal for the series. The organic-matter content decreases irregularly with depth because of the periodic deposition of alluvium from flooding. A buried older A horizon also may be present.

Lithic Haplumbrepts.—The Kilchis soils are in this subgroup. These soils are shallow, stony, and well drained. The thin, dark reddish-brown A and B horizons are underlain by basalt at a depth of 12 to 20 inches. The B horizon has no evidence of clay illuviation. Base saturation is less than 50 percent.

Pachic Haplumbrepts.—The Knappa and Slickrock soils are in this subgroup. These soils are well drained. They have a dark-colored solum with chromas of 3 or less to a depth of more than 20 inches and base saturation

of less than 50 percent. Depth to bedrock ranges from 4 to 10 feet in the Slickrock soils. The B horizon has no significant evidence of clay illuviation.

Cumulic Hapludolls.—The Alsea soils are in this subgroup. They are moderately well drained loams more than 60 inches deep. These soils developed in alluvium. They have very dark brown and dark-brown horizons with moist chromas of 3 or less. The organic-matter content is 1 percent or more to a depth of about 29 inches. Base saturation is more than 50 percent, and clay illuviation is not evident in the solum. Within the 3-month period after June 21, the soil between depths of 4 and 12 inches is not dry for 60 or more consecutive days in more than 7 out of 10 years.

Typic Sideraquods.—The Depoe soils are in this subgroup. These poorly drained soils developed in stratified marine sediments overlying old stabilized dune sands. The surface horizon is dark-colored and has a high organic-matter content. The A2 horizon is mottled and overlies a horizon where illuviated aluminum and iron have accumulated. The lower part of the illuvial horizon is an indurated iron-cemented material called ortstein.

Typic Umbraquults.—The Hebo soils are in this subgroup. These soils are poorly drained. They have moist chromas of 1 or less on ped surfaces of the horizon where illuvial clay has accumulated. Base saturation is less than 35 percent at a depth of 50 inches below the upper boundary of the Bt horizon. These soils have a thick, dark-colored surface layer in which the organic-matter content is at least 1 percent.

Typic Haplohumults.—The Apt and Honeygrove soils are in this subgroup. They are well-drained clays that have a B horizon where eluviated clay has accumulated. Base saturation is less than 35 percent at a depth of 50 inches below the upper boundary of the illuvial B horizon. The organic-matter content in the upper 6 inches of the illuvial B horizon is 1.5 percent. The soil between depths of 4 and 12 inches is never dry for as much as 60 consecutive days in more than 7 out of 10 years.

Aquic Haplohumults.—The Chitwood soils are in this subgroup. These soils are moderately well drained and somewhat poorly drained. They have horizons containing illuviated clay. Base saturation is less than 35 percent at a depth of 50 inches below the upper boundary of the Bt horizon. The organic-matter content in the upper 6 inches of the Bt horizon is 1.5 percent. These soils also have mottles with chromas of 2 or less in the upper 10 inches of the Bt horizon.

Laboratory Data

This section presents laboratory data for selected soils in the Alsea Area. Table 6 summarizes the chemical properties, and table 7 gives the physical properties of these soils.

TABLE 6.—*Chemical properties of selected soils*

[Analyses by the Soil Testing Laboratory, Department of Soils, Oregon State University Dashes indicate data not available]

Soil and sample number	Horizon	Depth from surface	Reaction	Organic carbon	Nitrogen	Carbon-nitrogen ratio	Cation exchange capacity	Extractable cations (milliequivalent per 100 grams of soil)				Base saturation	Calcium-magnesium ratio
								Calcium	Magnesium	Sodium	Potassium		
		Inches	*pH*	*Percent*	*Percent*		*Meq./100 gm*					*Percent*	
Alsea loam:													
NW¼NW¼ lot 43, T. 14 S., R. 7 W.	Ap	0–6	6. 0	7 6	0 28	27. 1	40. 1	16. 2	9. 5	0 2	1. 2	67. 5	1 7
	A1	6–11	5. 9	6 6	. 22	30 0	42. 1	15. 6	9. 5	. 5	. 5	62. 0	1. 6
	A3	11–14	5. 8	6 3	. 22	28 6	41. 1	15. 6	10. 0	. 3	. 4	64 0	1. 6
	B1	14–19	5. 8	5. 6	------	--------	40. 7	16. 2	10. 3	. 3	. 3	66. 6	1. 6
	B21	19–29	5. 9	4. 2	------	--------	39. 4	15. 9	10. 3	. 5	. 3	68. 5	1. 5
	B22	29–35	5. 9	6. 1	------	--------	39. 2	17. 5	11. 0	. 3	. 3	74 2	1 6
	B23	35–45	6 0	1. 5	------	--------	32. 8	16. 5	10. 8	. 4	. 2	85. 1	1. 5
	B3	45–55	6. 0	1. 2	------	--------	28. 4	17. 5	10. 3	4	. 2	100 0	1. 7
Apt clay:													
S½NW¼SW¼NE¼, sec. 19, T. 14 S., R. 7 W.	A11	0–2	6 3	6 9	. 32	21. 6	45. 0	31. 1	12. 4	. 3	3. 5	100. 0	2. 5
	A12	2–8	6. 5	5 1	. 29	17. 7	41. 9	25. 6	10. 0	. 2	3. 0	92. 6	2 6
	B1t	8–19	5. 9	1 9	11	16 9	34. 2	8. 0	5. 0	. 2	1. 0	41. 5	1 6
	B21t	19–24	5. 6	. 8	. 06	13. 7	34. 2	6. 1	4. 2	. 3	. 4	32. 2	1. 5
	B22t	24–37	5. 7	. 4	. 03	13 0	35. 3	4. 0	2. 9	. 3	. 3	21. 2	1. 4
	B23t	37–49	5 8	. 3	. 03	9. 0	32. 6	3. 4	2. 9	. 3	. 3	21. 2	1. 2
	B3	49–63	5. 5	. 5	. 03	12 0	33. 5	2. 5	2. 2	. 2	. 3	15. 5	1. 1
Blachly clay loam:													
N½SW¼SE¼NW¼, sec. 22, T. 15 S., R. 8 W.	A1	0–9	5. 6	7 1	. 22	32. 4	36 3	2. 3	1. 1	. 3	. 6	11. 8	2. 1
	B11	9–20	6 0	1. 5	. 18	18. 1	17. 5	1 7	. 7	. 2	. 3	16. 3	2. 6
	B12	20–31	5. 7	1. 0	. 16	16 8	15 9	1. 3	. 6	. 3	. 2	15. 2	2. 2
	B21	31–44	5 7	. 6	. 04	14 8	16. 0	1 0	. 5	. 2	. 3	13. 2	2. 0
	B22	44–53	5 6	. 3	. 02	17. 0	12. 3	1 0	. 5	. 2	. 2	14. 3	2. 2
	B23	53–78	5. 6	. 2	. 03	8 0	10. 9	1. 3	. 4	. 1	. 2	18 2	3. 3
	B3	78–94	5. 7	. 3	. 02	8 5	20. 0	. 6	. 5	. 1	. 1	6. 3	1. 3

See footnotes at end of table.

TABLE 6.—*Chemical properties of selected soils*—Continued

Soil and sample number	Horizon	Depth from surface	Reaction	Organic carbon	Nitrogen	Carbon-nitrogen ratio	Cation exchange capacity	Extractable cations (milliequivalent per 100 grams of soil) Calcium	Magnesium	Sodium	Potassium	Base saturation	Calcium-magnesium ratio
		Inches	*pH*	*Percent*	*Percent*		*Meq /100gm*					*Percent*	
Bohannon gravelly loam:													
W½SW¼NW¼, sec. 22,	A1	0–4	5 9	4 6	. 14	33 1	27 9	4 2	1 8	. 2	. 9	25. 1	2 4
T. 15 S., R. 8 W.	A3	4–11	6 0	2. 9	. 13	22. 5	23. 1	4 2	2 0	. 2	. 7	30 6	2 2
	B2	11–17	6 0	1 6	. 13	20. 3	19. 9	2 5	1 7	. 1	. 5	24. 1	1 5
	B3	17–24	6 0	1 0	15	19. 8	17. 4	2. 0	2 2	. 3	. 5	28. 3	9
	IIR [1]	24–58	5 8	. 9	04	22 3	20 1	1. 0	2. 2	. 3	. 3	18. 8	. 5
Clatsop silty clay loam:													
SW¼NW¼NW¼ sec. 27,	A1	0–6	5 4	19 1	1 07	17 9	40. 6	18 0	36 9	67. 3	4 8	([2])	. 5
T 13 S., R. 11 W.	C1g	6–18	5 7	6 7	67	10. 0	44 5	19. 5	31 2	47. 0	4. 3	([2])	. 6
	C2g	18–36	6 3	4 1	. 33	12 3	39. 7	9 1	23 1	38 1	4 4	([2])	. 4
Digger gravelly loam:													
SE¼SW¼NW¼ sec. 10,	A1	0–4	6 0	3. 5	. 14	24 6	28. 2	15. 4	6. 5	. 2	1 4	83. 5	2 4
T 14 S., R. 7 W.	B1	4–18	6 0	2 1	. 10	21. 2	24. 5	12 5	6. 4	. 2	. 7	80. 9	2 0
	B2	18–30	5 9	6	. 04	14. 8	23. 1	13 6	8 7	. 2	1. 0	97. 3	1. 8
Hatchery gravelly loam													
S½SE¼NE¼ sec. 20,	A1	0–9	6 2	4 0	. 14	28 4	43. 2	27. 7	10 0	. 5	2 4	93 7	2 8
T. 14 S , R. 7 W.	B21	9–11	6 5	1 5	. 07	21. 9	35 1	21 2	8 2	. 5	1 9	90. 5	2. 6
	B22	21–32	6 4	1. 1	. 05	22 6	34 4	19 8	8 6	5	1. 6	88. 6	2. 3
	C&R [1]	32–45	6 5	1 1	. 05	22 8	37. 2	23. 0	9. 4	. 7	1 5	93 0	2. 5
Honeygrove clay													
W½SE¼NW¼ sec. 10,	A1	0–6	6 4	4 4	. 28	15 7	35 7	12 2	7 3	3	3. 4	66. 6	1. 6
T 14 S , R. 7 W.	A3	6–12	6 1	4 0	. 18	22 2	33. 4	3. 4	2 5	. 5	. 8	21 6	1. 4
	B11	12–19	5 7	2 4	11	21. 9	28. 2	5 4	3. 1	. 2	2. 0	38. 0	1 8
	B12t	19–27	5 6	1 2	06	9 0	26 8	11 0	5 0	3	3 2	72. 6	2. 2
	B21t	27–36	5 5	. 3	. 04	7. 5	24 8	4 1	2 9	3	. 3	30. 4	1. 4
	B22t	36–72	5 4	. 3	. 03	10 0	24 5	2 5	1 8	2	. 2	18. 7	1. 4
	B23t	72–95	5 4	. 1	. 02	6. 5	23. 1	1. 4	1 4	. 3	. 2	14. 2	1 0
	B3t	95–105	5 3	. 2	. 02	9 5	25 6	1. 3	1. 1	. 2	. 3	11. 4	1. 2
Lint silty clay loam:													
NW¼SE¼SW¼NE¼	A1	0–11	5 1	8 0	41	19 6	45. 6	. 4	1 3	. 6	. 8	6. 8	. 3
sec 28, T. 13 S., R.	A3	11–20	5 0	4 2	. 17	24 8	33 0	1	. 7	. 6	. 3	5. 1	. 1
11 W.	B2	20–28	5 1	1. 1	. 06	18. 3	21. 8	. 2	. 4	. 5	. 1	5. 5	. 5
	B3	28–45	5 2	. 6	. 04	15. 5	20 4	. 1	. 6	6	. 1	6. 8	. 2
	C	45–60	5. 1	. 3	. 02	15 0	15 8	2	. 3	6	. 1	7. 6	. 7
Marty silty clay loam.													
SW¼SE¼ sec 13,	A11	0–5	4 9	10 0	. 29	34 8	33 1	5. 4	1. 5	. 5	. 6	24. 2	3. 5
T. 13 S , R 7 W.	A12	5–14	4 8	1 9	. 08	24 0	14. 0	. 4	3	. 4	. 2	9. 3	1 3
	IIB1	14–26	5. 7	1 5	. 06	23. 9	13 2	5	. 3	4	2	10 6	1 6
	IIB21	26–39	5 0	1 2	. 06	20. 6	14. 6	. 2	. 2	3	1	5 5	1 0
	IIB22	39–60	5 2	. 4	. 03	12 9	16 8	. 4	. 2	. 4	. 1	6. 5	2. 0
Mulkey loam													
W½SW¼NE¼SW¼	A11	0–10	4 9	16 0	. 80	20 0	44. 9	1 4	1 5	. 3	. 6	8 5	. 9
sec. 21, T 12	A12	10–19	5 0	8 3	55	15 0	43 4	1 2	. 8	3	3	5. 8	1. 4
S., R. 7 W.	B2	19–26	5 3	5 3	. 29	18 4	31 5	. 1	. 8	. 4	. 1	4. 4	. 1
Preacher clay loam:													
N½NW¼NW¼SW¼	A1	0–6	5. 3	4 9	25	19 4	32 8	2 1	2 5	. 5	6	17 4	. 8
sec 24, T 15	A3	6–14	5. 1	3. 2	. 19	16 8	26 0	. 2	. 6	. 4	. 5	6 2	. 6
S , R 10 W.	B21	14–28	5 2	2 2	. 14	16. 1	23 1	. 3	. 4	. 4	. 3	6. 0	. 8
	B22	28–42	5 1	1 6	. 11	15 1	21 1	. 3	4	. 5	. 3	6 5	. 9
	IIC	42–60	5 0	. 2	. 16	1. 2	26 0	. 2	. 4	5	2	4 9	. 5
	IIR [1]	60–70	5 0	. 2	. 02	9 5	27 0	. 2	. 4	4	2	4. 3	. 5
Slickrock gravelly loam													
W½SW¼NW¼NE¼ sec.	A1	0–3	5 8	4 0	. 19	21 0	30. 4	9 8	3 8	------	. 9	47. 7	2 6
4, T. 15 S , R. 9 W.	A3	3–7	5 6	4 6	26	17. 7	33 5	6 4	2 9	------	. 8	30. 2	2 2
	B21	7–14	5 4	4 0	21	19 0	30 1	2 7	1 5	------	. 3	15. 1	1 8
	B22	14–23	5 6	1 7	. 11	15 4	23 5	1. 2	. 6	------	. 3	9 2	2 0
	B31	23–47	5. 4	5	03	16 7	23 7	7	3	------	. 3	5 4	2 8
	B32	47–55	5 5	5	03	16 7	22 0	2 8	9	------	. 4	18 5	3 1

[1] Laboratory data presented for soil material obtained from cracks in the bedrock.
[2] Free salts present.

TABLE 7.—*Physical properties of selected soils*

[Analyses made by the Soil Physical Laboratory, Department of Soils, Oregon State University. Dashes indicate data not available]

Soil and sample number	Horizon	Depth from surface	Particle-size distribution: Greater than 2 mm.[1]	Particles less than 2 mm.: Sand	Silt	Clay	Textural class	Bulk density	Moisture held at tension of— 0.1 atmosphere	0.5 atmosphere	5 atmospheres	15 atmospheres
		Inches	*Percent*	*Percent*	*Percent*	*Percent*		*Gm/cc.*	*Percent*	*Percent*	*Percent*	*Percent*
Apt clay. S½NW¼SW¼NE¼ sec. 19, T. 14 S., R. 7 W.	A11	0–2	5	18.4	38.5	43.1	Clay	---	---	---	---	---
	A12	2–8	5	15.0	40.1	45.0	Clay	---	---	---	---	---
	B1t	8–19	5	11.0	36.5	52.6	Clay	1.2	46.0	42.7	33.3	24.7
	B21t	19–24	15	8.8	34.2	57.0	Clay	---	---	---	---	---
	B22t	24–37	20	8.5	42.3	48.2	Gravelly silty clay.	1.2	49.1	45.9	38.4	24.0
	B23t	37–49	30	8.3	42.1	49.6	Gravelly silty clay.	---	---	---	---	---
	B3	49–63	50	16.9	47.3	35.8	Very gravelly silty clay loam.	---	---	---	---	---
Blachly clay loam N½SW¼SE¼NW¼ sec. 22, T. 15 S., R. 8 W.	A1	0–9	5	27.6	39.5	33.1	Clay loam	.7	59.4	50.0	32.1	26.3
	B11	9–20	0	15.5	28.1	54.9	Clay	---	---	---	---	---
	B12	20–31	0	14.8	26.4	58.7	Clay	---	---	---	---	---
	B21	31–44	0	14.8	22.4	64.6	Clay	1.0	42.9	38.1	28.0	25.3
	B22	44–53	0	13.9	22.8	63.2	Clay	---	---	---	---	---
	B23	53–78	0	16.1	20.6	63.1	Clay	1.2	37.6	34.9	27.4	25.0
	B3	78–94	0	15.6	22.2	62.1	Clay	---	---	---	---	---
Bohannon gravelly loam: W½SW¼NW¼ sec. 22, T. 15 S., R. 8 W.	A1	0–4	20	45.7	28.2	24.7	Gravelly loam	.9	41.2	29.4	20.3	14.6
	A3	4–11	20	49.0	32.4	18.5	Gravelly loam	---	---	---	---	---
	B2	11–17	20	51.6	29.4	19.5	Gravelly loam	1.0	36.2	27.9	19.2	13.5
	B3	17–24	30	48.6	30.0	21.4	Gravelly loam	---	---	---	---	---
	(2)	24–58	30	48.1	30.8	21.4	Gravelly loam	---	---	---	---	---
Clatsop silty clay loam. SW¼NW¼NW¼ sec. 27, T. 13 S., R. 11 W.	A1	0–6	0	(3)	(3)	(3)	---	---	---	---	---	---
	C1g	6–18	0	(3)	(3)	(3)	---	---	---	---	---	---
	C2g	18–36	0	8.5	47.9	43.6	Silty clay	---	---	---	---	---
Digger gravelly loam S½SE¼SW¼NW¼ sec. 10, T. 14 S., R. 7 W.	A1	0–4	40	41.8	36.6	21.7	Gravelly loam	---	---	---	---	---
	B1	4–18	20	42.0	36.0	22.0	Gravelly loam	---	---	---	---	---
	B2	18–30	45	45.5	30.0	24.5	Gravelly loam	---	---	---	---	---
Honeygrove clay. W½SE¼NW¼ sec. 10, T. 14 S., R 7 W.	A1	0–6	0	24.2	34.5	40.3	Clay	.7	56.0	43.1	26.1	21.4
	A3	6–12	5	22.9	35.1	42.0	Clay	---	---	---	---	---
	B11	12–19	0	20.9	31.6	48.5	Clay	---	---	---	---	---
	B12t	19–27	0	17.9	32.2	49.9	Clay	---	---	---	---	---
	B21t	27–36	0	16.4	29.6	54.0	Clay	---	---	---	---	---
	B22t	36–72	0	16.1	25.6	58.3	Clay	---	---	---	---	---
	B23t	72–95	5	17.7	26.7	55.7	Clay	---	---	---	---	---
	B3t	95–105	5	20.5	27.6	51.7	Clay	---	---	---	---	---
Mulkey loam: W½SW¼NE¼SW¼ sec. 21, T. 12 S., R. 7 W.	A11	0–10	5	36.7	40.5	22.8	Loam	.8	69.1	49.9	21.9	26.2
	A12	10–19	20	39.0	47.4	13.7	Gravelly loam	---	---	---	---	---
	B2	19–26	30	44.5	45.0	10.5	Cobbly loam	---	---	---	---	---
Preacher clay loam: N½NW¼NW¼SW¼ sec 24, T 5 S., R 10 W.	A1	0–6	5	31.1	34.9	33.9	Clay loam	---	---	---	---	---
	A3	6–14	0	30.4	34.2	35.4	Clay loam	.9	50.0	43.6	26.4	23.2
	B21	14–28	10	29.7	36.0	34.3	Clay loam	---	---	---	---	---
	B22	28–42	10	29.7	36.0	34.3	Clay loam	---	---	---	---	---
	IIC	42–60	5	67.9	25.0	7.1	Silty loam	---	---	---	---	---
	(2)	60–70	80	69.2	14.5	16.3	Silty loam	---	---	---	---	---

[1] Volume estimates to nearest 5 percent.

[2] Laboratory data presented for soil material obtained from cracks in the bedrock.

[3] Content of organic matter too high for analysis.

The pH was measured with a Beckman Zeromatic instrument.[6] Organic carbon was determined by the potassium dichromate oxidation method. Total nitrogen was determined by a Kjeldahl method.

Extractable calcium, magnesium, sodium and potassium were determined by flame photometry. Cation exchange capacity was then determined by the ammonium acetate method (*1*). Percent base saturation was calculated from the sum of extractable calcium, magnesium, potassium, and sodium and the cation exchange capacity.

Percent of soil material more than 2 millimeters in diameter was estimated to the nearest 5 percent, by volume. The particle-size distribution was determined by the pipette method. Bulk density was determined by use of the Uhland core sampler. Moisture retention at 0.1, 0.5, 5, and 15 atmospheres was determined by use of pressure membrane apparatus.

General Nature of the Area

This section discusses settlement and development, land ownership, climate, drainage and water use, vegetation, wildlife, and recreation in the Alsea Area.

Settlement and Development

The Alsea Area was populated by Indians of the Alsea Tribe of the Yakonan linquistic stock. Mooney (*9*) estimates that in 1780 there were about 6,000 Indians of the Yakonan stock. After this date, epidemics apparently swept the Indian populace and materially decimated its number until, by 1910, the census showed only 29 Indians of the Yakonan stock. This depletion of the Indian population reduced friction and encouraged development by settlers. The first two settlers were Rettneaur and Ellis, who lived near the present town of Alsea in 1852. They were soon followed by the Rycrafts, Hugdens, and Holgates. Settlement of the Tidewater area came in 1865. Schools were opened in 1862 near Alsea and in 1871 near Tidewater (*16*).

Forest fires swept most of the Alsea Area prior to and following settlement. In 1849, an extensive fire covered most of the southwest third of the Area. Later, most of the forest west of Marys Peak to the coast and north of the Alsea River was burned (*10*). In most places, even-aged stands of Douglas-fir apparently became established about 10 to 15 years after the fire.

The early agricultural land use was mostly grazing and cultivation of crops in the fertile valleys. Wheat, flax, oats, and fruit were the common crops. Hogs and cattle were fed local grain and were allowed to graze the bottom lands and adjacent slopes (*7*).

Transportation to markets in the Willamette Valley was difficult because access to the area was poor. In winter when the river was high, some of the produce from these early farms was loaded on scows or flatboats and floated down the Alsea River to Waldport. The goods were then sold and the scows broken up for lumber. The trip from Alsea to Tidewater took 10 to 12 hours and apparently was quite dangerous, as indicated by such present names as Old Hellion Rapids, Digger Creek Rapids, and the Narrows (*16*).

Several mills were built. A sawmill was operated near Alsea in the late 1850's and other sawmills were opened in 1868, 1872, and 1884. Flour and grist mills were opened near Alsea in 1873 and 1884 (*7*).

During the period from 1883 until about 1905, many land claims were made and temporary homes erected in compliance with the Homestead Act of 1863. Most of these claims were on upland sites because the bottom lands had been claimed, cleared, and settled earlier. Most of these later land claims were poorly suited to farming. The majority failed, and today only a few families live on farms in the uplands. Many of these abandoned farms changed ownership during the 1930's and now support thrifty stands of Douglas-fir from 20 to 40 years old. Farming is now limited to the bottom lands and to low terraces along the major streams. Small grains, berries, green beans, nuts, and bulbs are grown, but most of the land is in unimproved pasture. The distance, time, and cost required to deliver produce, such as beans and berries, to processing plants in the Corvallis area are considered prohibitive. The uplands are now used primarily for timber, water, and wildlife.

Waldport and Alsea are the only towns in the survey area. Waldport has 700 residents, and Alsea has 400 residents (*14*).

The main transportation system consists of a north-south highway along the coast and an east-west highway along the Alsea River. State Highway 34 follows the Alsea River, and U.S. Highway 101 follows the coastline and crosses Alsea Bay at Waldport. The county roads are along the main tributaries to the Alsea River, and several connect with roads constructed by the U.S. Forest Service and the U.S. Bureau of Land Management. There are short sections of pavement on the Alsea-Lobster Valley Road and on the Bayview Road north of Alsea Bay. Federal agencies, private corporations, and individuals have built and maintained the secondary road system.

Some sawmills in the Willamette Valley depend on a supply of timber from the Alsea Area. There are only two sawmills in the Area. One of these produces veneer sheets that are trucked to the Williamette Valley for processing into plywood.

Land Ownership

The land in the Alsea Area is owned by the Federal Government and by private individuals or organizations. The U.S. Forest Service manages the largest tract of land. A few large tracts of privately owned land are around Alsea Bay, north of Table Mountain, in the vicinity of Tidewater, and along the North Fork of the Alsea River near the town of Alsea. The area of alternate-section ownership is in the east half of the survey area. The U.S. Department of the Interior, Bureau of Land Management, manages most of the odd-numbered sections. The even-numbered sections are mostly private land. This complex ownership pattern produces many management and right-of-way problems (*5*).

The ownership of the Alsea Area was used as a basis for sharing costs of the soil survey. The U.S. Forest Service manages about 35 percent of the survey area, and

[6] Trade and company names are included for the specific information of the reader and do not imply any endorsement by the United States Department of Agriculture.

the U.S. Bureau of Land Management manages about 25 percent. The remaining 40 percent is in private ownership. The U.S. Forest Service land is mostly in the Waldport and Alsea Districts, and the lands of the Bureau of Land Management primarily are in the Alsea Rickreall Master Unit.

Climate [7]

The Alsea Area has a marine climate that is typical of the coastal area of Oregon. Winters are cool and wet, and summers are warm and dry. Prolonged periods of daily minimum temperature below 20° F. or daily maximum temperature above 95° F. are uncommon. The average annual number of days when the temperature is higher than 28° is 294 at Tidewater, 200 at Valsetz, 317 at Newport, and 200 at Alsea. Table 8 gives temperature and precepitation data obtained at stations in or near the survey area.

The climate varies from place to place because of differences in relief or geographic location. Three climatic subareas that have different climatic characteristics have been recognized and are shown in figure 11. The subareas are (1) the Waldport, (2) the Tidewater, and (3) the Alsea.

The Waldport climatic subarea is geographically associated with an ancient marine terrace along the coast and a few miles inland. In most places the elevation is less than 500 feet. During the winter, warm, moist air masses are lifted in crossing the colder land surface of the Coast Range. This results in considerable cloudiness and frequent rains from late fall to early in spring. More than two-thirds of the 60 to 80 inches of precipitation received in this subarea falls in winter, but the short-period intensity is not high. Snow makes up a very small part of this total and usually is not persistent. Winds of gale force are experienced several times each winter.

During the summer months, the air inland rises rapidly when heated by the warm surface. This air is replaced by cooler air moving in from the ocean, and this often brings fog and low stratus clouds. Fog usually does not persist inland farther than the eastern limit of the Waldport climatic subarea. Few storms move inland from the Pacific Ocean during the summer. Therefore, the total precipitation from June through September is less than 10 percent of the annual average. Temperatures are mild. The average daily maximum varies less than 15° F., and the average daily minimum varies less than 13° from summer to winter.

The Tidewater climatic subarea is inland from the coast and occurs in areas having ridges at elevations of 1,000 to 3,000 feet. This subarea is the wettest of the three and is represented in table 8 by data from Tidewater and from Valsetz. Although the Valsetz data are taken from outside the Alsea Area, they probably represent the climate at an elevation of about 1,500 feet.

During the winter, considerable cloudiness and frequent rains occur as the moist air moving in from the

[7] This subsection was prepared with the assistance of G L釋 STERNES, climatologist for Oregon, National Weather Service, U S. Department of Commerce; and HOWARD GRAHAM, meteorologist, U S. Forest Service, Portland, Oregon.

TABLE 8.—*Temperature and precipitation at stations in or near the Alsea Area*

TIDEWATER [1] (TIDEWATER CLIMATIC SUBAREA)

Month	Temperature: Average daily Maximum	Temperature: Average daily Minimum	Temperature: Average daily Mean	Precipitation: Average monthly total	Precipitation: Average snowfall
	°F	°F	°F	Inches	Inches
January	46.5	33.8	40.2	[2] 15.4	[3] 0.1
February	51.8	37.1	44.5	13.1	.4
March	55.5	37.4	46.5	12.2	([4])
April	61.9	41.2	51.5	6.1	([4])
May	67.1	44.5	55.8	4.0	0
June	71.3	48.1	59.7	2.2	0
July	75.9	51.3	63.6	.9	0
August	75.9	52.1	64.0	1.1	0
September	73.8	48.7	61.1	3.2	0
October	64.4	45.8	55.1	8.6	0
November	54.1	39.9	47.0	13.1	([4])
December	48.7	37.3	43.0	15.2	.2
Year	62.2	43.1	52.7	95.1	.7

VALSETZ [5] (TIDEWATER CLIMATIC SUBAREA)

Month	Maximum	Minimum	Mean	Average monthly total	Average snowfall
January	44.5	29.8	37.2	17.2	[6] 8.3
February	49.4	33.4	41.4	17.8	3.2
March	53.0	34.7	43.8	15.5	2.0
April	59.4	37.1	48.3	7.9	.1
May	65.9	41.0	53.5	4.8	0
June	70.3	44.5	57.4	3.2	0
July	77.4	47.0	62.2	1.2	0
August	75.7	46.6	61.2	1.5	0
September	73.1	44.8	59.0	3.8	0
October	62.7	41.3	52.0	12.0	0
November	52.9	35.9	44.0	17.0	.4
December	47.1	34.5	40.8	22.3	1.5
Year	61.0	39.2	50.1	124.2	15.5

NEWPORT [7] (WALDPORT CLIMATIC SUBAREA)

Month	Maximum	Minimum	Mean	Average monthly total	Average snowfall
January	49.8	38.5	44.2	9.0	1.1
February	51.4	39.1	45.3	8.3	.1
March	53.2	39.7	46.5	8.1	([4])
April	56.1	42.0	49.1	4.4	([4])
May	59.3	45.5	52.4	2.7	([4])
June	62.1	49.0	55.6	2.4	0
July	64.3	50.8	57.6	.7	0
August	64.6	50.9	57.8	.9	0
September	64.5	49.0	56.8	2.1	0
October	61.0	46.4	53.7	5.6	([4])
November	55.5	42.4	49.0	8.5	([4])
December	51.1	39.8	45.5	10.3	([4])
Year	57.7	44.4	51.1	63.0	1.2

[1] 11-year period of record at Tidewater, Oregon. Data from Climatic Summary of U.S., No. 11–31, Oregon.

[2] 23-year period of record at Tidewater, Oregon. Data from Climatic Summary of U.S., No. 11–31, Oregon.

[3] 8-year period of record at Tidewater, Oregon. Data from Climatic Summary of U.S., No. 11–31, Oregon.

[4] Trace.

[5] 15-year period of record at Valsetz, Oregon. Data from Climatic Summary of the U.S., No. 11–31, Oregon.

[6] 12-year period of record at Valsetz, Oregon. Data from Climatic Summary of the U.S., No. 11–31, Oregon.

[7] 30-year period of record at Newport, Oregon. Data from Climatological Summary, Climatography of the United States 20–35.

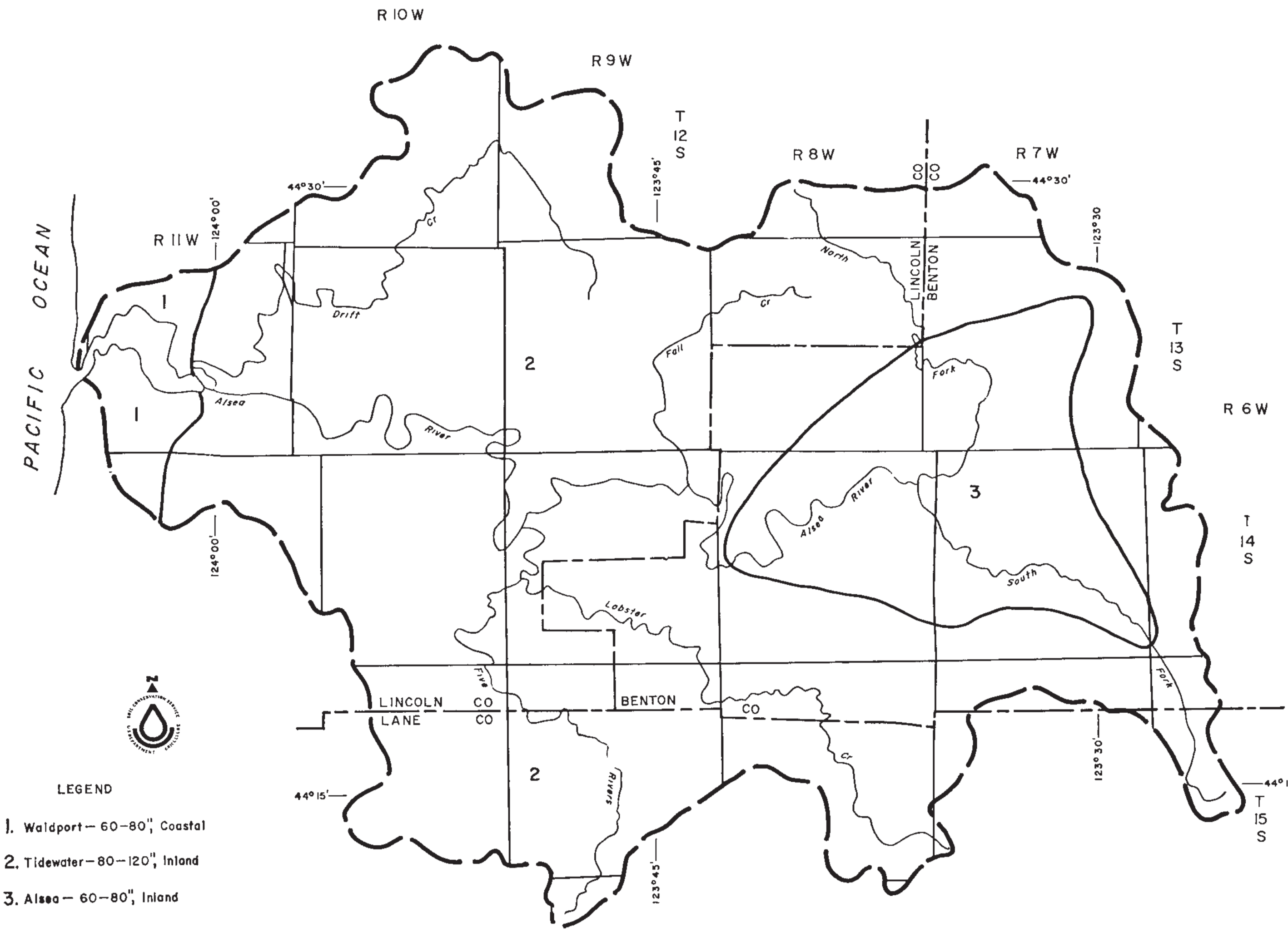

***Figure 11.*—Climatic subareas of the Alsea Area.**

ocean rises and cools. During the period from October through May, more than nine-tenths of the 80 to 120 inches of precipitation received in this subarea falls as rain. Daily precipitation of 2.5 inches and monthly totals of 25 inches are not uncommon during December and January, but intensities are low. Snow makes up only a small part of this total and generally is not persistent. Winds of gale force are less common than along the coast.

During the summer, this subarea generally is clear. Less than one-tenth of the annual total precipitation occurs during the months of June through September. Along the coast, fog and clouds do not penetrate this far inland, except in a few valleys where they usually dissipate by about midmorning. Temperatures are mild, but ranges in temperature are greater than along the coast. From summer to winter, the average daily maximum varies about 30° and the average daily minimum varies about 18°.

The third climatic subarea is in the vicinity of Alsea. Here, the relief is low and the elevation ranges from 200 to about 1,100 feet. Before reaching this subarea, incoming marine air and storms from the west and southwest pass over many ridges where the elevation is 1,200 to 1,500 feet and where much moisture condenses. There are fewer high mountains in the immediate vicinity of Alsea and therefore less precipitation. More than nine-tenths of the 60 to 80 inches of precipitation received in this subarea falls during the period from October through May. Snow makes up only a small part of the total precipitation and usually does not persist. Winds of gale force are not so common as they are in the other two climatic subareas. This subarea usually is clear in summer. Low fog in the valley is common but usually dissipates by midmorning. Rainfall during the period from June through September makes up less than one-tenth of the total precipitation. Temperature and precipitation data for the Alsea climatic subarea are not given in table 8.

Except for Valsetz, the stations listed in table 8 are at low elevations. Measurements that would more adequately represent parts of the survey area at elevations of 1,500 to 3,000 feet are not available. The soil scientists noticed that the temperature was somewhat higher and the wind

velocity lower in the valleys than at elevations of 1,500 feet or more. The frequency of other meteorological events such as severe ice storms and windstorms also are important to the land manager, but few data are available. Ice storms result in many broken tree limbs and leaders. Windstorms cause the same kinds of damage as ice storms, but in addition, trees growing on shallow soils may be blown over.

Drainage and Water Use

One of the main objectives of multiple-use resource management is to obtain the best use of waterbeds to serve water needs and to promote favorable water flow and quality. It is desirable that water quality (temperature, purity, color), water yield, and seasonal distribution be maintained or improved.

The flow in winter is large compared to that in summer. Runoff data closely follow trends of the monthly precipitation, except early in fall and late in spring. Runoff in fall remains low until the dry soil becomes wet. In spring, when precipitation is low, runoff may continue to be high because of the drainage of saturated soils and seepage from fractured bedrock.

The water is used mainly for forest plant growth and limited irrigation of farmland. Domestic use is not large, and the water is obtained primarily from individual water supply systems. Waldport is the only municipality having a central water supply, which is obtained by diversion from a tributary to Eckman Creek. The town of Alsea relies on water pumped from private wells.

Nonconsumptive uses for fish culture by the two fish hatcheries and by spawning anadromous fish require a supply of cool, clear water. Transported solids lower the porosity of spawning gravel and hence lower the oxygen supply to the eggs in the redd. In the hatcheries, hatching success is markedly lower as the solids settle directly on the eggs. Sediments in rearing ponds must be removed frequently. Other nonconsumptive uses are for recreation, such as swimming, boating, water skiing, and fishing, and, to a limited extent, for transporting human and industrial wastes.

The soils in the Alsea Area contribute, to some extent, to water storage and supply. The rate of runoff varies on these soils. Heavy rains occur in winter (a daily average of 2½ inches is common) when the soils are saturated and plant use is negligible. Even so, very little surface flow occurs. The water is absorbed rapidly by the surface layer and percolates downward or laterally, or in both ways through the large pores. This "through movement" is slow in deep, fine-textured soils that have small pores, and it is rapid in shallow, medium-textured soils that have large pores. After heavy rains, the runoff from shallow soils increases rapidly and is high for a short time. It then deceases rapidly when precipitation ceases. Runoff from deep soils increases slowly and then decreases slowly when precipitation ceases.

The main stream systems are the Alsea River and its North and South Forks, Five Rivers Creek, Fall Creek, and Drift Creek. Water, including Alsea Bay, occupies more than 2,100 acres in the survey area. Klickitat Lake is the only permanent natural lake and has an area of about 4 acres. Eckman Lake is man made and covers about 80 acres.

The origin of streams, their frequency, and their pattern are related to climate, geology, and geologic structure. The large amounts of precipitation and runoff facilitate geologic erosion and landscape development. Most streams follow the regional dip of the underlying sedimentary rocks westward toward the ocean and, therefore, can be classified as consequent streams. Wherever erosion-resistant sandstone or igneous rocks have caused detours in the usual westerly drainage pattern, the subsequent streams have developed. The North Fork of the Alsea River flows south and the South Fork flows northwest. The two meet at Alsea and flow westward through Alsea Bay to the Pacific Ocean. The other major tributaries flow either northwest or southwest towards the Alsea River.

The drainage pattern is mainly dendritic or trellis-dendritic with two exceptions. A radial stream pattern is evident at the following locations, all of which are capped by an intrusive sill. They are Yachats Mountain, Table Mountain, Cannibal Mountain, Prairie Peak, Grass Mountain, Marys Peak, Green Peak, and Flat Mountain. Of these, the pattern is most striking in the Table Mountain, Marys Peak, and Flat Mountain areas. The other exception is the rectangular stream pattern in the area of basalt bedrock between Prairie Peak and the South Fork Alsea River. This drainage pattern probably is due to structural control by rock fractures or faults.

The frequency and form of drainages also are related to soils and type of bedrock. High drainage density is associated with areas of shallow, stony, steep soils. Water storage capacity is low, and runoff is high from these soils. Most deep soils with gentle slopes have low drainage density, and runoff is slow and sustained. The number of drainages is very high in the sandstone areas and lower in the areas of basalt bedrock. In drainages that are undisturbed by recent logging or burning, the soils generally are well protected by vegetation down to the water's edge. Many drainages that have freshly exposed soil along the bank or show signs of stream scouring usually have been disturbed by large harvest areas or roads or both.

Water yields are measured at several stations distributed throughout the Alsea watershed and indicate seasonally large flows. The average annual discharge at Tidewater from 1939 to 1960 was 1,547 cubic feet per second. However, the flow is by no means uniform. At Tidewater, from 1959 to 1962, the average flow in January was 2,735 cubic feet per second and the average flow in August was 120 cubic feet per second. The maximum daily flow during the period from 1939 to 1960 was 32,800 cubic feet per second, recorded in September, 1958. The high winter flows are associated with winter rainstorms that occur when the soils are saturated. Stream levels and velocities may markedly decrease because of low precipitation, limited water storage in soils and bedrock, and the presence of few springs.

The streambeds of the Alsea River and its principal tributaries have alternating gentle rapids and slow, deep pools about one-eighth mile long. The banks are steep but are well protected from erosion by a thick cover of blackberry or salmonberry bushes and other shrubs. Bank erosion is not common along the larger streams, except where structures have restricted channel width or where the channel has been straightened. There are many water-

falls on the tributaries, such as those on the North Fork and South Fork of the Alsea River and on Fall Creek and Racks Creek.

Nearly all of the soils used for domestic livestock pasture formed in alluvium along major drainageways. During summer, permanent pastures which have been improved are irrigated.

Vegetation

Several persistent and striking variations in vegetation are evident in the Alsea Area. Among the factors that influence the distribution of plants are man's disturbance, climate, and soil characteristics. Since soil is only one of many factors affecting plant distribution, there are few unvarying relationships between vegetation and individual soils.

Relationships between vegetation and soil are not so clear cut in the Alsea Area as they are in places where conditions for plant growth are less favorable. This is partially due to the overwhelming influence of climate on plant growth. Supplies of moisture for plant growth are adequate for most, if not all, of the growing season, and this overshadows differences in soil characteristics, such as soil depth or available water holding capacity. As a result, soils having widely different characteristics may support similar stands of vegetation.

Another factor obscuring relationships between soils and vegetation in this Area is that the vegetative cover commonly is temporary or changing. In many places the plant communities have not reached an equilibrium with their environment, including the soils. An example of transitional vegetation is the brackenfern—salal plant community. This community, always the result of extensive disturbance of the vegetation, such as logging or temporary farming, grows on a variety of soils under a wide range of climatic conditions. Although this plant grouping may appear relatively stable, encroachment by trees causes rapid changes in plant composition. Fortunately, limited areas have escaped serious disturbance, and these provide examples of more stable vegetation. These stands have been of considerable aid in defining the relationships between soils and vegetation. They are, however, confined to a rather narrow range of soil and climatic conditions.

The total plant community was mapped concurrently with the soils. Maps showing plant communities were prepared as overlay sheets to the soil survey field sheets (*6*). These maps and detailed descriptions of the plant communities are available at the Oregon Agricultural Experiment Station, Corvallis, Oregon. The plants were classified as part of the understory, as shown in figure 12, or the overstory (see fig. 13). Relationships of these plant groups to soils and other factors are described in the following paragraphs. Relationships between soils and the understory plant community are described first.

Brackenfern—salal community.—The distribution of the brackenfern—salal community is closely related to previous management practices. Most areas of this cover type are near population centers that were settled at an early date and cleared for agricultural use. The largest concentration of this community lies south and east of Alsea. The vegetative cover on soils such as Digger, Hatchery, Apt, and Honeygrove soils was extensively disturbed.

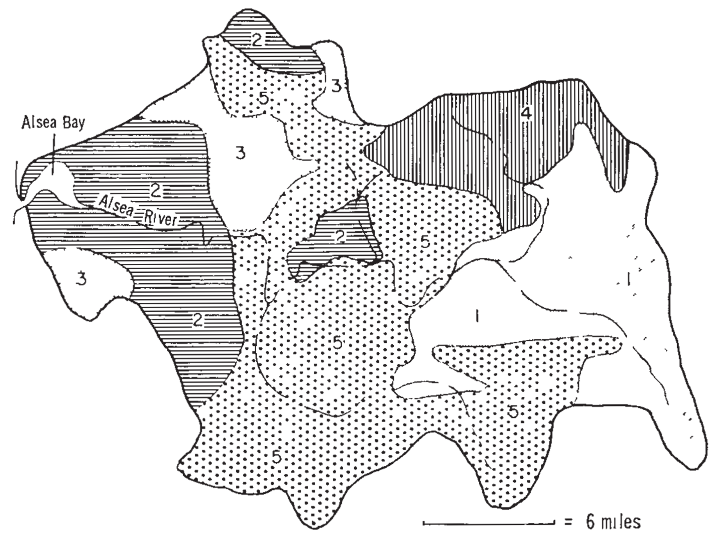

***Figure 12.*—Generalized map showing distribution of ground vegetation by understory plant communities. These communities are as follows: (1) brackenfern—salal, salal—brackenfern, ocean spray—salal, and salal; (2) salmonberry—swordfern; (3) salal—swordfern; (4) vine maple—salal; and (5) vine maple—swordfern, swordfern and swordfern—oxalis.**

Areas of Blachly soil were also cleared because of the gentle slopes and proximity to bottom land in valleys. Many of these areas were burned annually to promote grass growth and reduce the vigor of encroaching salal and conifer seedlings.

Soil series with the highest proportion of their total area occupied by the brackenfern—salal community are Blachly, Honeygrove, Klickitat, and Hatchery. Shallow, stony soils derived from basalt in the area of both high and low rainfall have a greater proportion of their acreage occupied by the brackenfern—salal community than comparable soils derived from sandstone. This difference in ground vegetation cover does not appear to carry over where the soils are deep and fine textured. For example, Blachly and Honeygrove soils on sandstone and Honeygrove soils on basalt have a comparable proportion of their area occupied by the brackenfern—salal community.

Salal—brackenfern community.—The occurrence of this community tends to parallel that of the brackenfern—salal. This might be expected since the salal—brackenfern community generally is associated with a partial overstory of young Douglas-fir. It represents a more advanced successful state than the brackenfern—salal community.

Because the salal—brackenfern community is not widely distributed, no soil has a large percentage of its area occupied by this grouping. Soils having the highest proportion of their area occupied by the salal—brackenfern community are Blachly and Hatchery. Soils with a smaller but appreciable quantity are Preacher, Honeygrove, Klickitat, and Digger.

Ocean spray—salal community.—This understory community, more than any other, is representative of relatively dry conditions in the Alsea climatic subarea (see fig. 11). In this subarea, stands have been severely disturbed and hence few examples of this community remain. The following soils have areas of ocean spray—salal and are listed in order of decreasing amount: Dig-

ger, Klickitat, Marty, Honeygrove, Blachly, Preacher, and Hatchery. The range for these soils is 3 to 10 percent of their total acreage occupied by this community.

Salal community.—The salal community was not mapped extensively in the Alsea Area. However, this grouping occurred commonly as inclusions on ridgetops or in other vegetation mapping units. It was mapped most extensively on the Bohannon soils, but the soils having the highest proportion of their area occupied by this community were the Klickitat and Trask. Even here, however, the proportion was less than 5 percent of their total acreage. This community is on the driest soils under established timber stands. Therefore, it is not surprising that it is most common on the shallow, stony Klickitat and Trask soils, and where probably there is some moisture deficiency during the growing season.

Salmonberry—swordfern community.—The salmonberry—swordfern community is generally associated with red alder, where this tree is dominant, and is restricted mainly to the western part of the survey area. This community normally represents an early successional stage on sites that eventually support stands of western hemlock or, near the coast, western hemlock and Sitka spruce. Soils supporting the salmonberry—swordfern community are almost exclusively those derived from Tyee sandstone; that is, the Bohannon, Preacher, and Slickrock soils.

Salal—swordfern community.—Most examples of this community occur in a strip along the coast. The soils and the percentage of their total acreage occupied by this community are Ferrelo (45 percent), Desolation (22 percent), and Fendall (13 percent). Bohannon gravelly loams, syenite substratum, occur farther inland and have 21 percent of their area occupied by this community. Although the proportions are smaller, large areas of this community are on soils that formed in material weathered from sandstone in the Tidewater climatic subarea (see fig. 11). The series represented are Preacher, Bohannon, and Slickrock.

The soil series on which this community occurs represent a wide range of soil characteristics from shallow, stony Bohannon soils to deep, well-drained Desolation soils. Climatic factors probably exert a great influence on the distribution of this community.

Vine maple—salal community.—The vine maple—salal community shows a definite affinity for soils formed in material weathered from basalt parent rock in the Tidewater climate subarea (see fig. 11). The soils with the highest proportion (43 percent) of their area occupied by the vine maple—salal community are Blachly clay loams, basalt substratum. Other soils and the percentage of their area in this community are Klickitat (30 percent), Kilchis (17 percent), and Marty (10 percent).

Vine maple—swordfern community.—The vine maple—swordfern community is by far the most common understory community in the Alsea Area. This community occurs in greatest quantities on soils that formed in material weathered from sandstone in the Tidewater climatic subarea (see fig. 11). Thirty-nine percent of the total area of both the Bohannon and Slickrock series is occupied by the vine maple—swordfern community. The corresponding figure for the Preacher soils is 23 percent. Of the soils derived from igneous rock, Klickitat soils have the greatest amount; approximately 53 percent of their total area is covered by this plant community. The relationship between this vegetation type and soils appears to be the reverse of that noted for the vine maple—salal community. That is, in the Tidewater climatic subarea, the vine maple—swordfern vegetation apparently favors soils derived from sandstone, whereas the vine maple—salal community favors soils derived from basalt.

Swordfern community.—The swordfern community occurs in small areas on many soils. It is located in almost equal amounts on comparable soils of the Alsea and Tidewater climatic subareas (see fig. 11). This grouping generally occurs under mature or nearly mature timber stands. Apparently the characteristics of the overstory timber stand are important in controlling the distribution of the swordfern community.

To illustrate the wide variety of soils on which this community thrives, the following soils have 20 percent or more of their total acreage occupied by the swordfern grouping: Ferrelo, Hatchery, and the Skinner-Desolation complexes. Soils range from shallow and stony in the Alsea climatic subarea to deep, well drained, and sandy in the Waldport climatic subarea. However, there are indications that many of the swordfern stands on the Hatchery soils are not representative of this community.

Swordfern—oxalis community.—This community occurs less commonly than any other in the Alsea Area. It generally is on fairly moist sites under timber stands that are mature and dense. Perhaps because of its limited occurrence, no relationships between the swordfern—oxalis community and any particular soil were found.

Two other minor vegetation types occur only on specific soils. Salt-marsh vegetation is always associated with Clatsop soils. It consists of salt-tolerant sedges and grasses around Alsea Bay, where the water table is influenced by the brackish tidal water. Soils supporting this vegetation are subject to periodic tidal inundation. The combination of high salinity and a high water table prevents conifer or shrub growth.

The sedge-grass-fern type is the second minor vegetative type. It is always associated with Mulkey soils and occurs on mountain meadows on Marys Peak, Prairie Peak, and Grass Mountain. Tree growth on Mulkey soils is restricted by inadequate soil moisture as a result of a shallow solum and few fractures in the bedrock. Invading trees must also compete against a well-established vegetation that, because of its density and thick root mat, quickly removes most of the available moisture during the dry summer.

Four basic classes of vegetative cover are present in the overstory in the Alsea Area (fig. 13). These classes are: (1) mostly fully stocked with species of coniferous trees; (2) mostly fully stocked with a mixed stand, dominantly conifers but some hardwoods; (3) mostly fully stocked, dominantly with hardwood species; and (4) areas only partly occupied by trees. In most places the coniferous trees are Douglas-fir and hemlock and the hardwoods are mainly red alder.

As figure 13 indicates, the survey area is almost completely covered with trees, except for the area near the town of Alsea. The largest area is the one occupied by pure stands of conifers, but areas of conifers and hardwoods are also fairly common. Pure or almost pure stands of hardwoods are largely restricted to the western part of the area.

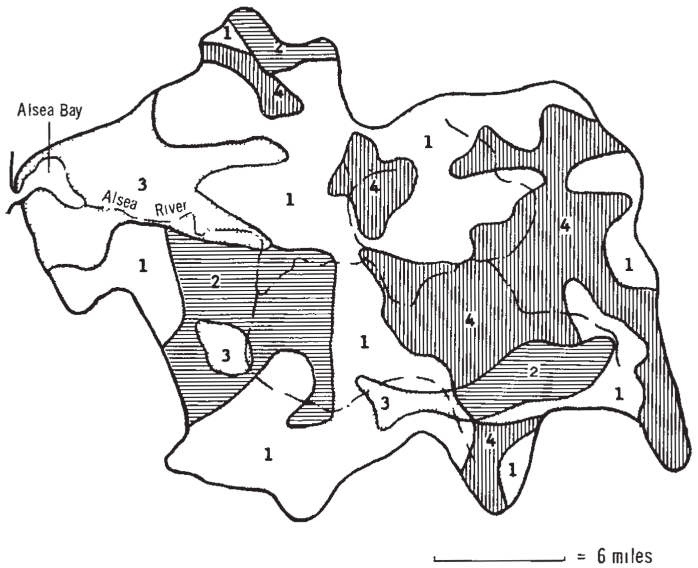

Figure 13.—**Generalized map showing stocking of timber stands in the Alsea Area. Canopy density of 40 percent or greater: (1) conifers, (2) conifers and hardwoods, (3) hardwoods and hardwoods and conifers. Canopy density of less than 40 percent; (4) mixed hardwoods and conifers.**

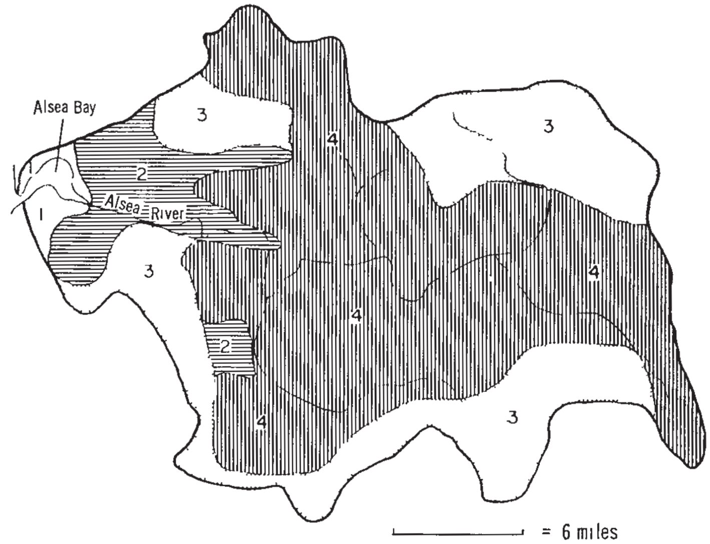

Figure 14.—**Generalized map showing types of forest cover in the Alsea Area: (1) spruce and hemlock, (2) red alder, (3) Douglas-fir and western hemlock, (4) Douglas-fir.**

The pattern of land use is among the chief determining factors in controlling timber stocking. Many of the areas shown in figure 13 as unstocked were recently logged and undoubtedly will become stocked again within several years.

A generalized map of forest cover types in the Alsea Area is shown in figure 14. Four major types of forest cover in the Area are: (1) spruce and hemlock, (2) red alder, (3) Douglas-fir and western hemlock, and (4) Douglas-fir.

Included with the spruce and hemlock type is shore pine, especially near the coast, near farming areas, and around tidal flats and marshes. Also included are large areas occupied by brush.

Included with the red alder type are many areas of pure stands of young Douglas-fir and hemlock, as well as areas of mixed Douglas-fir and alder.

Included with the Douglas-fir and western hemlock type are many harvested or burned areas. Also included are areas having a prairie-type vegetation, such as that on Prairie Peak, Grass Mountain, and Marys Peak.

Included with the Douglas-fir type are farming areas, especially around Alsea, and small patches of Oregon white oak.

The spruce and hemlock type occurs near the coast in the Waldport climatic subarea. The soils are moderately fine textured to fine textured, are mostly well drained, and were derived from shale. This type generally is not present on the sandy, well-drained soils adjacent to the beach or on the well-drained soils derived from sandstone and basalt east of Alsea Bay. Much of this area was logged before 1920 and is currently in brush and alder. Only scattered remnants of the original stand were observed. The alder stands have a dense understory in which the plant community is salmonberry—swordfern. This is a highly productive site and will eventually revert to conifers if left undisturbed.

The old-growth stands of spruce and hemlock generally have a thick organic mulch, part of which is mottled mar. The surface layer has a high content of organic matter, and the base saturation is very low. The accumulation of mottled mar is characteristic of spruce forests and is related to the acid nature of the litter, the nature of the organisms present, and the cool, wet climate.

The red alder type is concentrated on the first mountainous terrain inland from the coast. The precipitation is heavy and effective. The soils generally are well drained, are moderately fine textured, and were derived from sandstone or basalt parent rock. The soils derived from sandstone have a thicker, more porous surface layer and generally a greater depth to bedrock than typical soils in the Tidewater climatic subarea (see fig. 11).

Much of the area in the red alder type was logged prior to 1930. Most of the alder stands have a salmonberry—swordfern community in the understory. The site is very productive, and in many places conifers are beginning to overtop the alder. These areas will, in time, revert to conifers or to conifers and hardwoods. Except for a small area south of Alsea Bay, the major part of this alder zone probably supported the Douglas-fir and hemlock type prior to logging.

The Douglas-fir and western hemlock forest type occupies most of the areas at high elevations. It occurs on well-drained sites where temperatures are cool and precipitation is heavy. It is commonly in areas that escaped the widespread fires of the mid-1800s. Some of this type occurs in uneven-aged stands where hemlock becomes dominant in decadent Douglas-fir stands. It may also have occupied most of the area of the red alder type prior to logging or burning.

In a very few places at high elevations, nearly pure stands of even-aged hemlock are present. This type has a loose needle litter underlain by a layer of decomposing needle litter. The surface layer of mineral soil is thick and dark and contains a large amount of organic matter. Organic material is incorporated in the soil by the decom-

position of roots and needles, macrofauna and microfauna, tree throw, and downward movement of organic colloids. Soil properties vary widely under the Douglas-fir and hemlock type, which occurs primarily in the Tidewater and Alsea climatic subareas.

The Douglas-fir type generally is at intermediate elevations and is the most common type in the Alsea Area. It occurs in the Tidewater and Alsea climatic subareas (see fig. 11) on well-drained soils over sandstone and basalt parent rock. Alder, hemlock, and cedar are the principal associated tree species in the highest rainfall area, whereas maple is the most common associated species in the drier area. Cedar, alder, and hemlock commonly indicate locations where soil moisture rarely limits plant growth. Most of this type occurs as even-aged stands about 100 years old. This type apparently became established following the extensive fires of the mid-1800s.

A minor cover type in the overstory is present along the coastline. It is the shore pine type and is only in the Waldport climatic subarea. It is composed of shore pine or shore pine-spruce-hemlock having an understory of salal, rhododendron, and evergreen huckleberry. This vegetation is limited to sandy soils along the coastline. The organic layer may be very thick in undisturbed stands, particularly in poorly drained soils that have a thick layer of mottled mar.

Wildlife

Many game animals, including black-tailed deer and Roosevelt elk, inhabit the Alsea Area. There is also a varied and abundant supply of fish and birds in the watershed. Game fish are Chinook and coho salmon and steelhead, cutthroat, and rainbow trout. Crayfish are taken from the Alsea River and its tributaries for personal consumption. In Alsea Bay, there are several types of clams, Dungeness crab, sole flounder, ocean perch, sculpin, and other saltwater species. Two fish hatcheries, one on Fall Creek and the other on North Fork Alsea River, stocked the Alsea drainage with over 1½ million fingerlings and yearling coho salmon, steelhead trout, and cutthroat trout and provided several hundred thousand more steelhead and cutthroat for stocking other waters in the central Oregon coastal area. In the fall and winter months, fishing for steelhead and salmon is moderate to heavy in the Alsea River and Alsea Bay.

The habitat has ample food, water, and escape cover for deer and elk. This is provided by the numerous clearings that are created by the clear-harvest system of logging. After the timber harvest, there is greater brush density on soils derived from basalt and gabbro than on soils derived from sandstone. These clearings commonly have numerous patches of palatable browse species, such as red huckleberry, salmonberry, western dewberry, and vine maple. Deer browse heavily on the new growth of these plants. As the deer population increases, the deer may browse conifer seedlings if other more palatable plants are not available. Elk also concentrate on or near these clearings to browse edible forbs. Migration of animals between areas at high and low elevations is slight because the snowfall and snowpack are negligible.

The Oregon Game Commission permits the hunting of deer of either sex during a special extended season in the Alsea Area. These hunts help reduce the severe damage to farm crops and tree seedlings in cutover areas caused by the overgrazing of game animals.

Most game birds and animals seem to prefer the habitat associated with soils formed in material weathered from basalt. Band-tailed pigeons frequently congregate at springs where mineral-rich water issues from the basalt. For gizzard grit, many birds, including band-tailed pigeons and grouse, probably prefer the hard basalt pebbles to the soft sandstone.

In addition, the frequent use of basalt-derived soils by wildlife may be related to a high nutritive value of fruit and browse on these soils.

Recreation

The most common outdoor recreational activities in the Alsea Area are hunting, fishing, camping, swimming, water skiing, and some hiking. Locally, the sandy soils along the coast southwest of the Alsea Area are used most intensively for recreation. Skiing on Marys Peak is limited by the small area of adequate snowpack. Recreational use in the Alsea Area also is concentrated on soils under grass and timber on Marys Peak, and on soils developed from alluvium along the Alsea River. A large campground on Marys Peak is popular with residents from the nearby Willamette Valley, for the difference in temperature between the campground and the valley may be as much as 20 to 30 degrees on hot summer days.

From September to March, anglers take salmon, steelhead, and cutthroat trout from the Alsea River and its principal tributaries, from the ocean to a point upstream about 4 miles northeast of Alsea. Campgrounds and areas of boat launching are distributed along the larger streams.

Undisturbed streams are esthetically pleasing as alder and maple trees, interspersed with cedar and Douglas-fir, drape over the stream and shade the water.

The Forest Service has built and maintains five improved campgrounds on alluvial soils in the survey area. The Bureau of Land Management and Benton County have cooperated in the construction of a small park several miles south of Alsea.

The Forest Service has prepared an inventory of potential land for recreational development along the Alsea River, setting areas aside for future development. Protective roadside and waterfront zones and adjacent timberland slopes have also been reserved to maintain an attractive natural setting for public enjoyment of the recreational resources.

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Glossary

Acidity, soil. See Reaction, soil.

Aeration, soil. The process by which air and other gases in the soil are renewed. The degree of soil aeration depends largely on the size and number of soil pores and on the amount of water blocking those pores.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates such as crumbs, blocks, or prisms are called peds. Clods are aggregates produced by tillage or logging.

Allophane. A clay mineral that is amorphous or, in some cases, weakly crystalline

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradient lessens abruptly.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water holding capacity (also termed available water capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Clay. As a soil separate, the mineral soil particles less than 0 002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clear cutting. A system of cutting in which all trees are harvested so that the ground is left clear.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon This horizon is the one in which living organisms are most active and therefore is marked by the accumulaton of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are commonly called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in elaboration of its food and tissue. Among the elements obtained from the soil are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc. Plant nutrients obtained largely from the air and water are carbon, hydrogen, and oxygen.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7 0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; and alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4 5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5 1 to 5 5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6 0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum. Unconsolidated, partly weathered, mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil is formed.

Runoff. Refers to the amount of water removed by flow over the surface of the soil. The amount and rapidity of runoff are affected by factors such as texture, structure, and porosity of the surface layer; the vegetative covering; the prevailing climate; and the slope. The degree of runoff is expressed by the terms *very rapid, rapid, medium, slow, very slow,* and *ponded*

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0 05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Topography. See Relief.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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SOIL CONSERVATION SERVICE
FOREST SERVICE

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

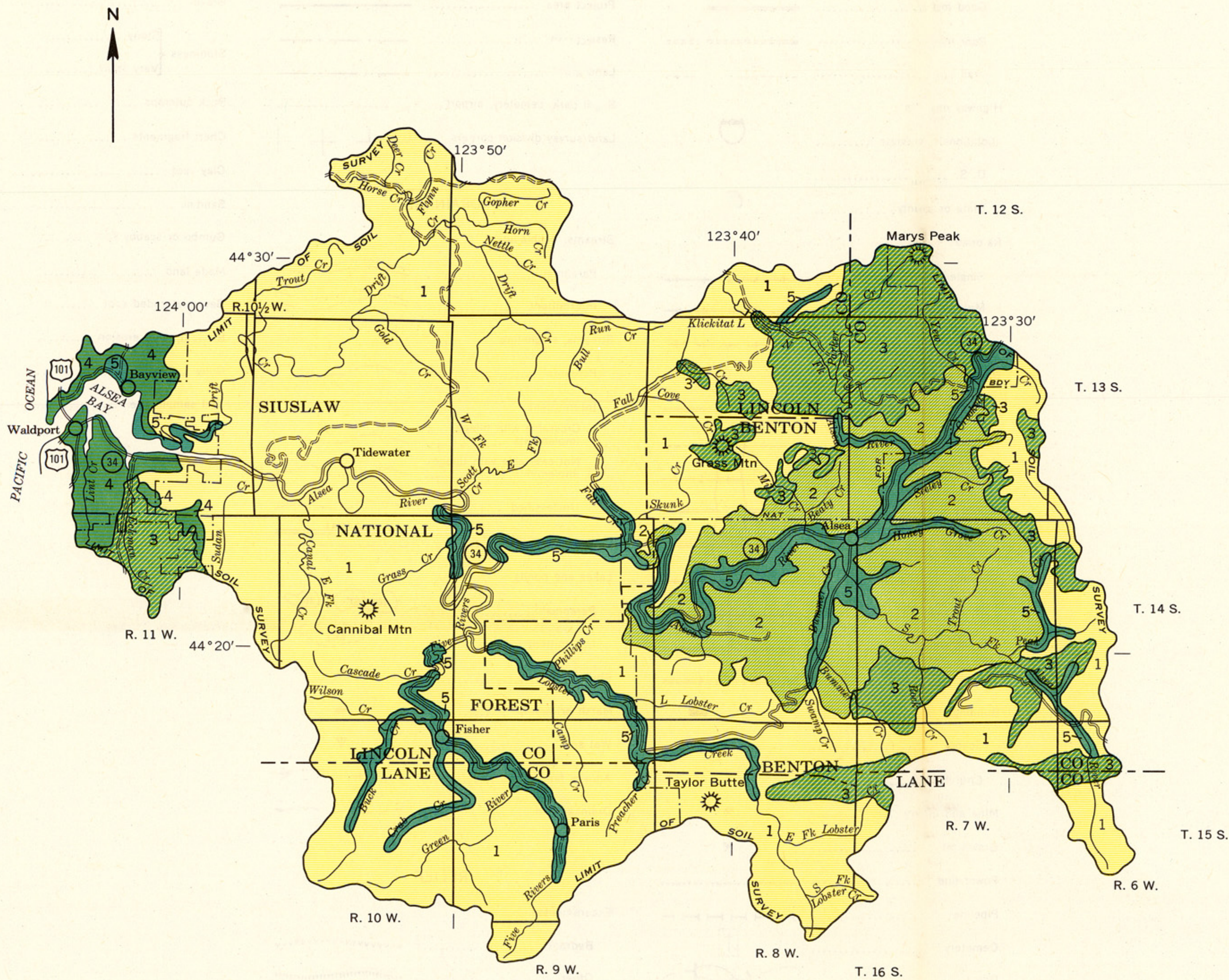
OREGON BOARD OF NATURAL RESOURCES
OREGON AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

ALSEA AREA, OREGON

Scale 1:253 440

1 0 1 2 3 4 Miles



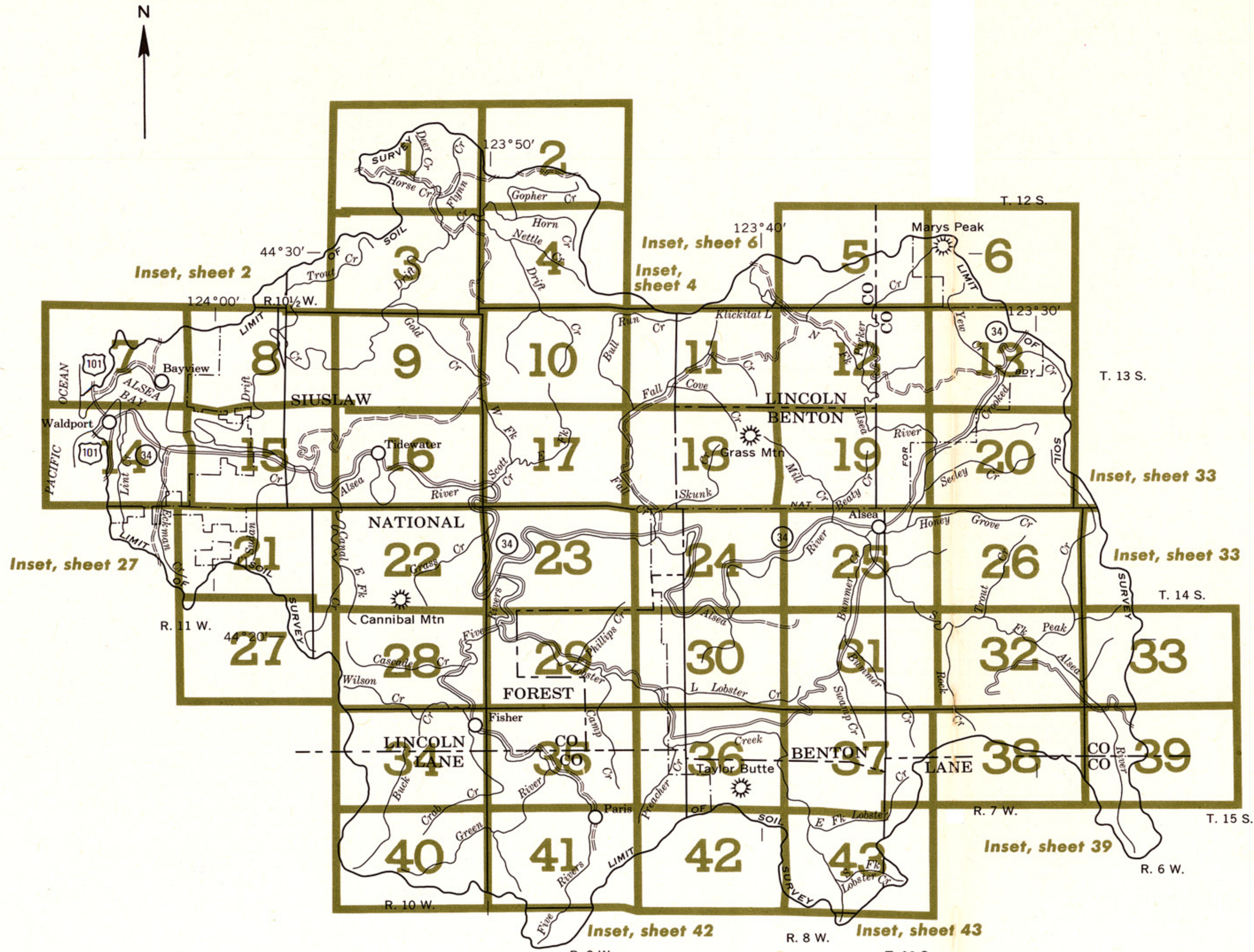
SOIL ASSOCIATIONS *

1	Bohannon-Slickrock association: Gravelly loam soils 20 to 40 inches deep over arkosic sandstone; and gravelly clay loam soils more than 48 inches deep to tuffaceous sandstone
2	Honeygrove-Digger Hatchery association: Clay soils more than 60 inches deep to bedrock; gravelly loam soils 20 to 40 inches deep over sandstone; and gravelly loam soils 20 to 40 inches deep over fractured basalt
3	Klickitat association: Very gravelly clay loam soils 40 to 50 inches deep over basalt
4	Skinner-Astoria-Fendall association: Cobbly clay loam soils 40 to 60 inches deep over basalt; clay soils 50 to 72 inches deep over siltstone; and clay soils 20 to 40 inches deep over shale
5	Knappa-Nehalem association: Silty clay loam and silt loam soils more than 60 inches deep

* Texture in the name of each association refers to the subsoil of the major soils.

Compiled 1972

This map is for general planning. It shows only the major soils and does not contain sufficient detail for operational planning.



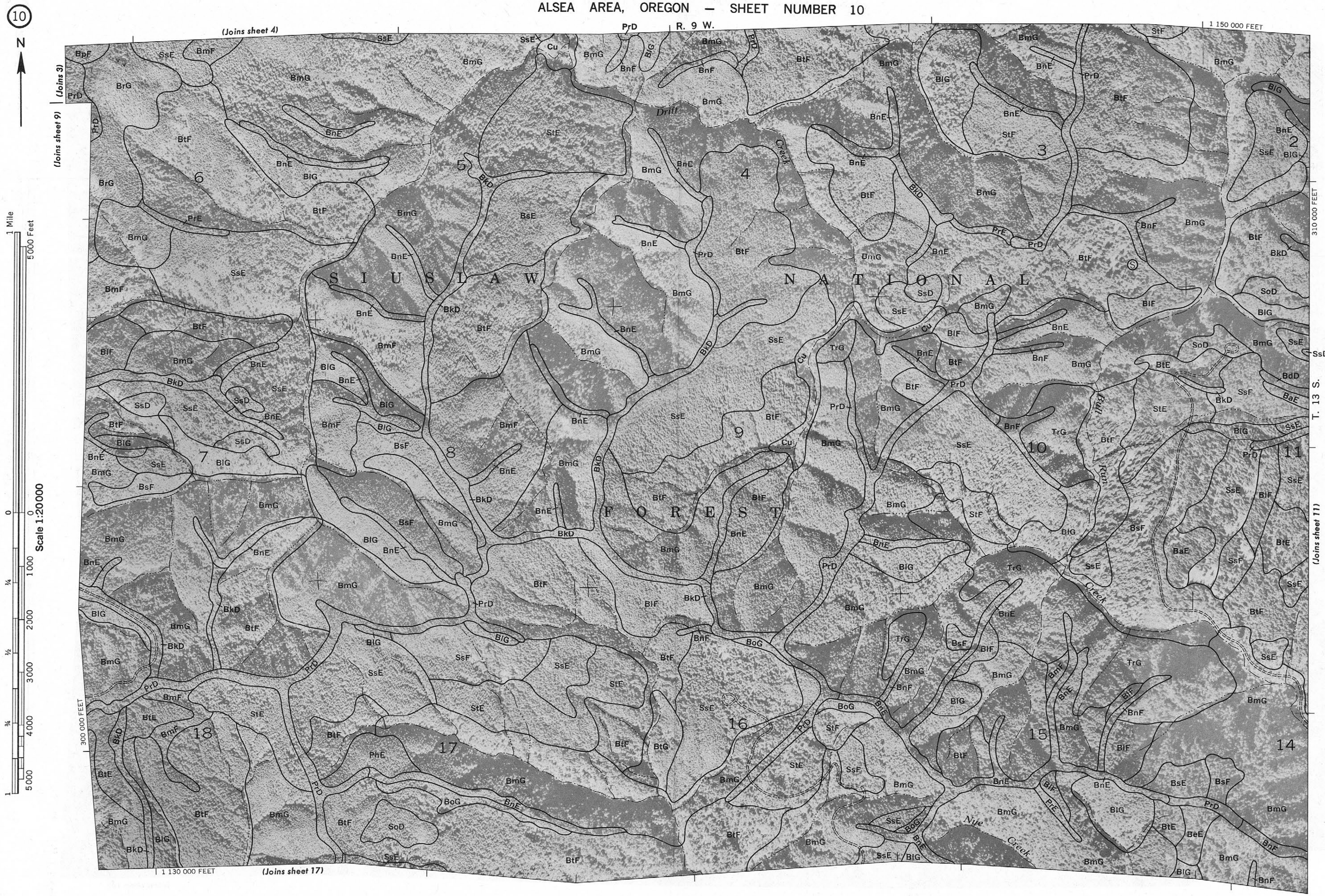
INDEX TO MAP SHEETS

ALSEA AREA, OREGON

Scale 1:253 440

1 0 1 2 3 4 Miles

Original text on each individual map sheet read:
This map is one of a set compiled in 1971 as a part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and Forest Service; United States Department of the Interior, Bureau of Land Management; the Oregon Board of Natural Resources; and the Oregon Agricultural Experiment Station. Photobase from 1952 and 1963 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Oregon coordinate system, north zone. Land division corners are approximately positioned on this map.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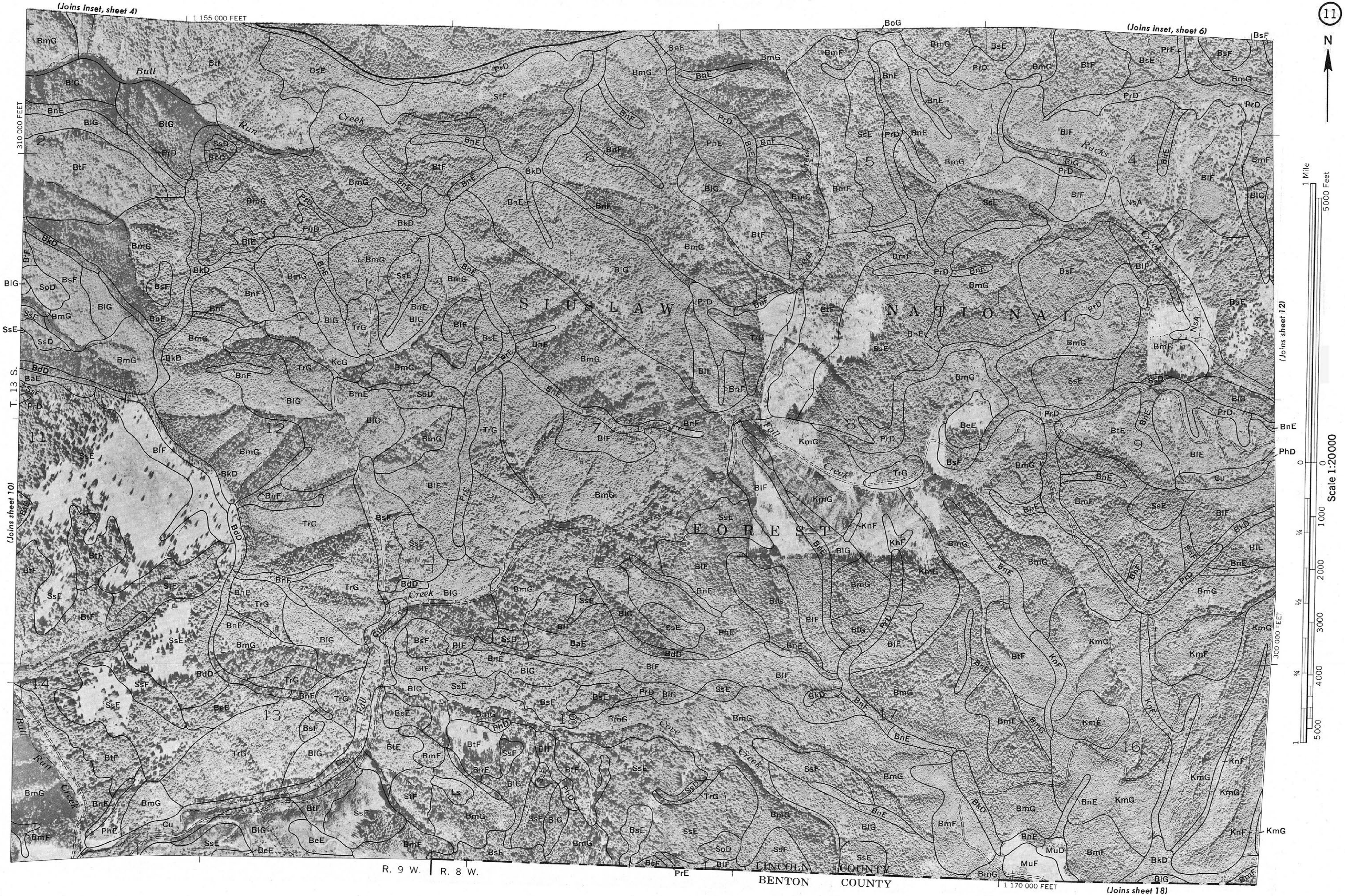
Scale 1:20000
1 Mile
5000 Feet
S I U S L A W   N A T I O N A L
F O R E S T
Drift Creek
Bull Run
Creek
Nye Creek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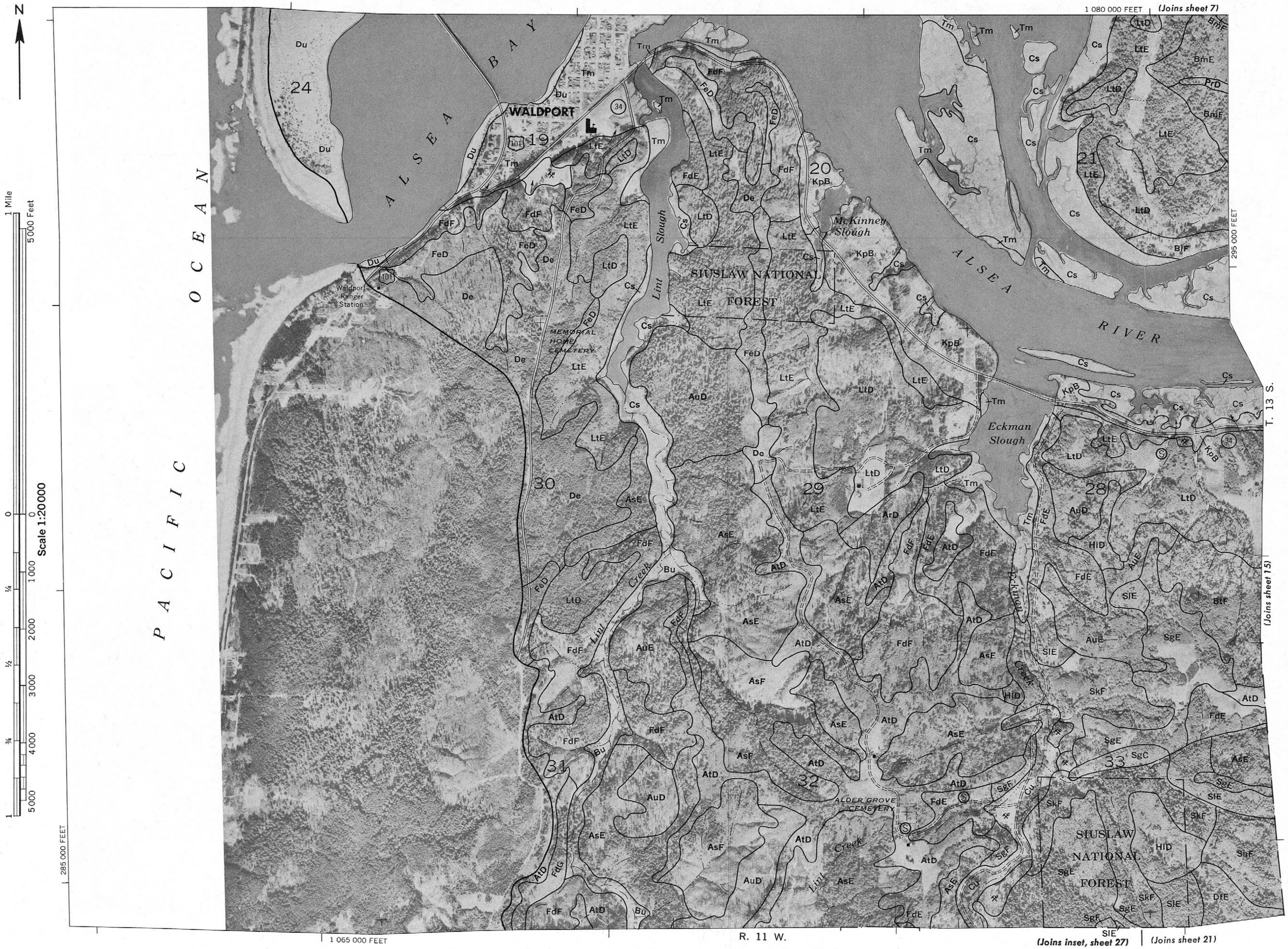
R. 9 W.
R. 8 W.
SIUSLAW NATIONAL FOREST
LINCOLN COUNTY
BENTON COUNTY
Bull Run Creek
Racks Creek
Fall Creek
Cove Creek
1 Mile
5000 Feet
Scale 1:20000

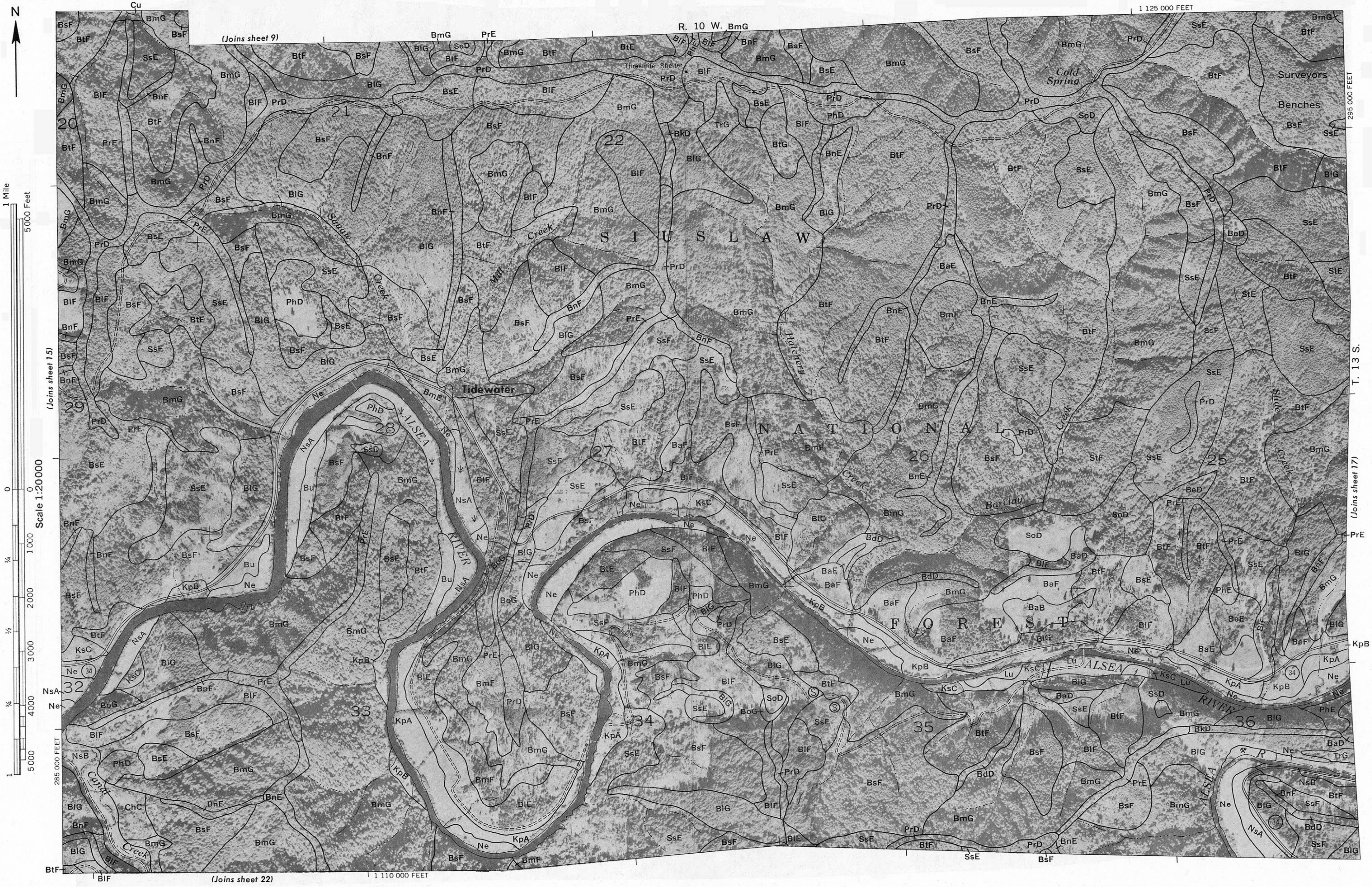
ALSEA AREA, OREGON — SHEET NUMBER 12

13

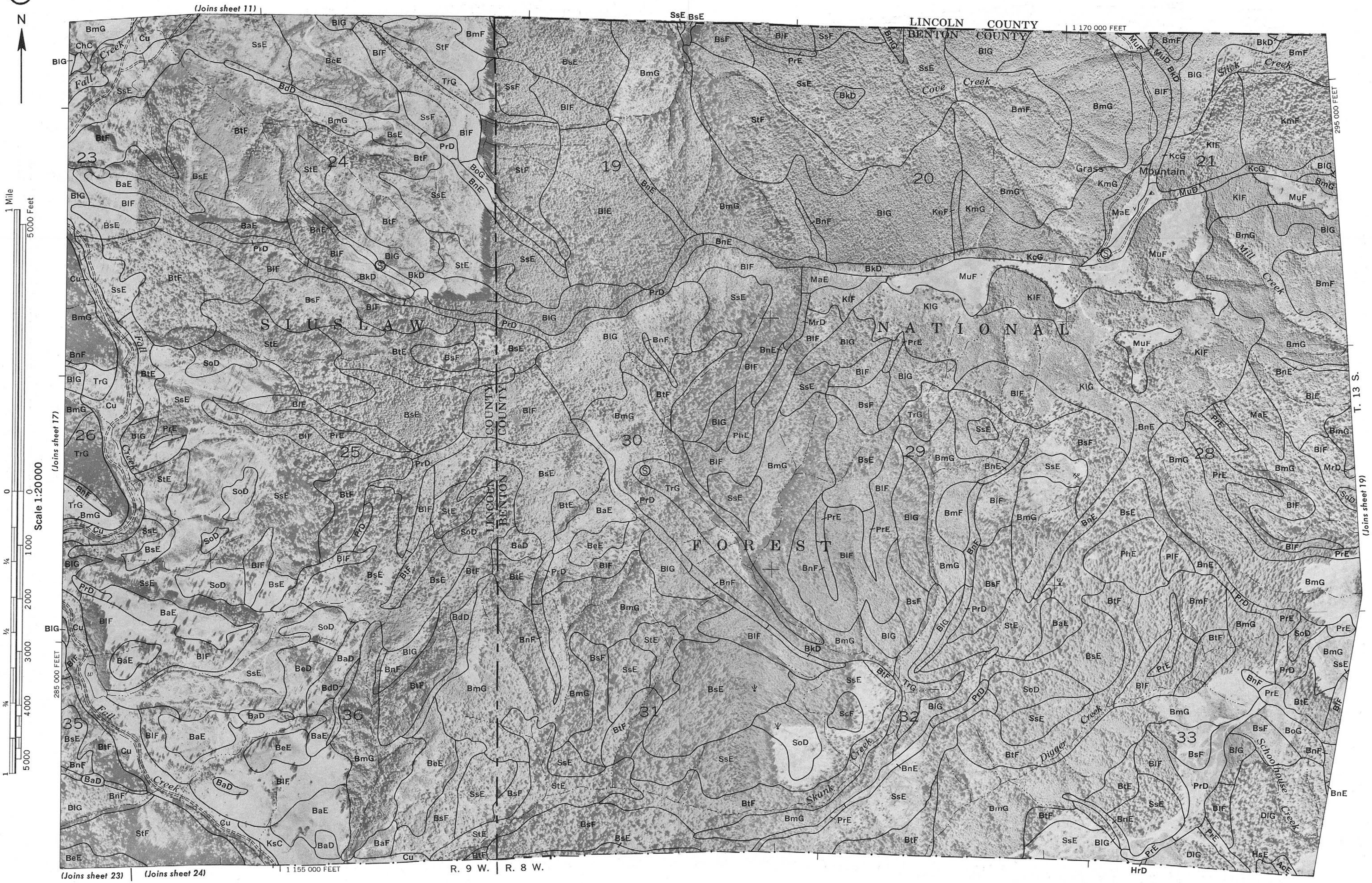

(Joins sheet 6)
1 205 000 FEET
R. 7 W.
SIUSLAW NATIONAL FOREST
Old Blue Mtn
Yew Creek
Alder Creek
Little Alder Creek
Crooked Creek
Cabin Creek
Zahn Creek
T. 13 S.
305 000 FEET
300 000 FEET
(Joins sheet 12)
(Joins sheet 20)
1 220 000 FEET
34
N
1 Mile
5000 Feet
Scale 1:20000


N
1 Mile
5000 Feet
Scale 1:20000
0
¼
½
¾
1
0
1000
2000
3000
4000
5000
1 080 000 FEET
(Joins sheet 7)
295 000 FEET
T. 13 S.
(Joins sheet 15)
285 000 FEET
1 065 000 FEET
R. 11 W.
(Joins inset, sheet 27)
(Joins sheet 21)
PACIFIC OCEAN
ALSEA BAY
WALDPORT
Waldport Ranger Station
MEMORIAL HOME CEMETERY
Lint Slough
McKinney Slough
SIUSLAW NATIONAL FOREST
ALSEA RIVER
Eckman Slough
Lint Creek
Eckman Creek
ALDER GROVE CEMETERY
SIUSLAW NATIONAL FOREST
24
19
20
21
28
29
30
31
32
33


15
N
R. 11 W. | R. 10 W.
(Joins sheet 8)
(Joins sheet 14)
(Joins sheet 16)
(Joins sheet 21)
1 085 000 FEET
1 100 000 FEET
295 000 FEET
285 000 FEET
T. 13 S.
SIUSLAW NATL FOREST
SIUSLAW NATIONAL FOREST
S I U S L A W N A T I O N A L
F O R E S T
A L S E A R I V E R
DRIFT CREEK
Wheelock Cr.
Wheelock Creek
Ellen Creek
Risley Creek
Butler Peak
Little Darkey Creek
Darkey Creek
Sudan Creek
Oxstable Creek
Arnold Creek
Bain Slough
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32
Scale 1:20000
1 Mile
5000 Feet
0
¼
½
¾
1
0
1000
2000
3000
4000
5000


N
(Joins sheet 9)
R. 10 W.
1 125 000 FEET
295 000 FEET
T. 13 S.
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 22)
1 110 000 FEET
285 000 FEET
1 Mile
5000 Feet
Scale 1:20000
SIUSLAW
NATIONAL
FOREST
ALSEA RIVER
Tidewater
Threemile Shelter
Cold Spring
Surveyors Benches
Squaw Creek
Mill Creek
Hatchery Creek
Barclay Creek
Slide Creek
Canal Creek
20
21
22
25
26
27
28
29
32
33
34
35
36

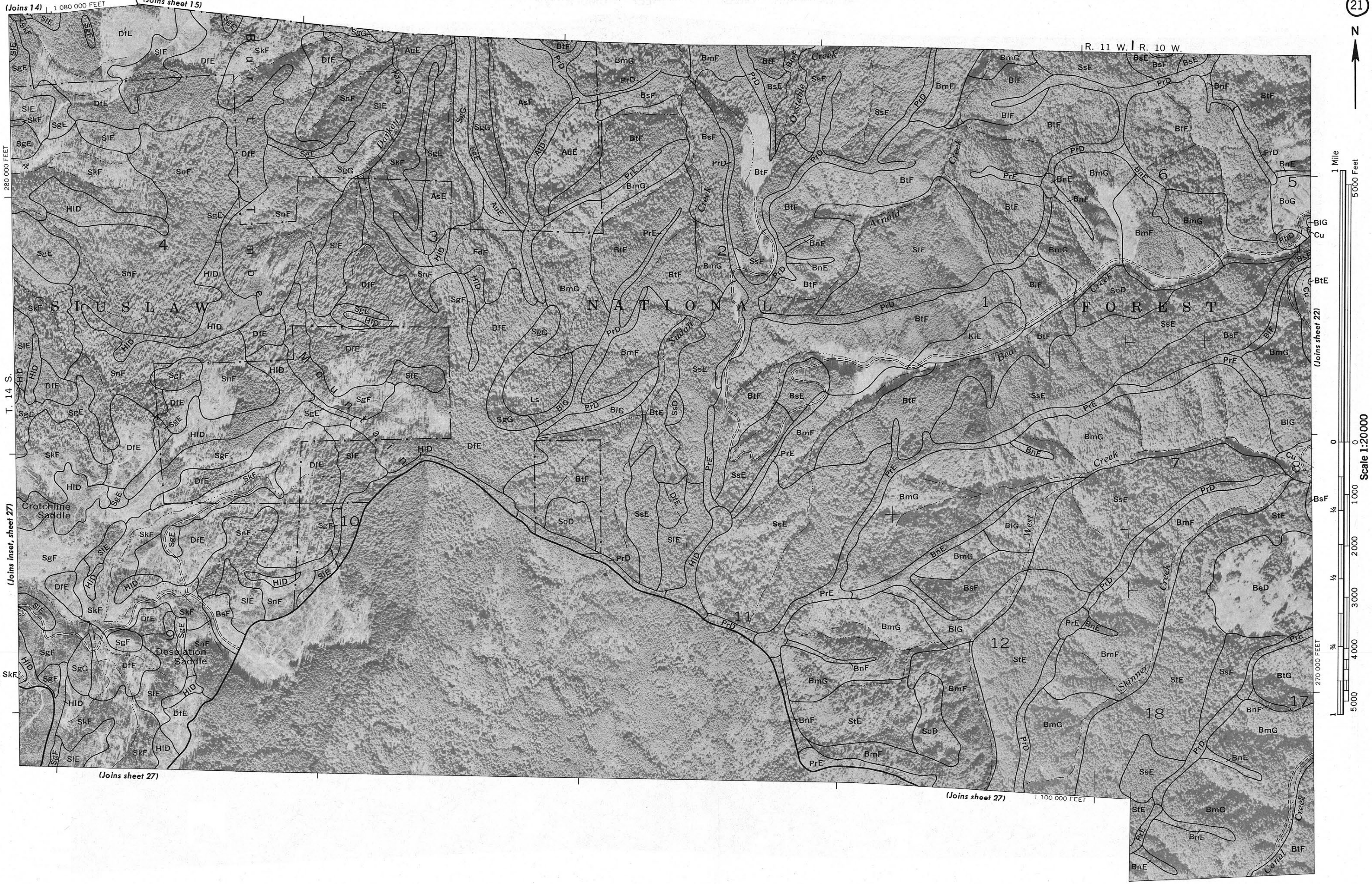
1 130 000 FEET
R. 9 W.
(Joins sheet 10)
N
(Sh 9)
(Joins sheet 16)
295 000 FEET
T. 13 S.
S I U S L A W
N A T I O N A L
F O R E S T
West Fork
Middle Ridge
East Fork
Nye Creek
Fall Creek
Scott Creek
Scott Mountain
ALSEA RIVER
Hellion Canyon
Butler Creek
Bear Creek
Carns Canyon
STATE FISH HATCHERY
19
20
21
22
23
26
27
28
29
30
31
32
33
34
35
(Joins sheet 18)
285 000 FEET
1 150 000 FEET
(22)
(Joins sheet 23)
1 Mile
5000 Feet
Scale 1:20000


N
(Joins sheet 11)
LINCOLN COUNTY
BENTON COUNTY
1 170 000 FEET
295 000 FEET
SIUSLAW NATIONAL FOREST
Grass Mountain
Cove Creek
Slick Creek
Mill Creek
Fall Creek
Digger Creek
Skunk Creek
Schoolhouse Creek
T. 13 S.
(Joins sheet 17)
(Joins sheet 19)
285 000 FEET
1 155 000 FEET
R. 9 W.
R. 8 W.
(Joins sheet 23)
(Joins sheet 24)
1 Mile
5000 Feet
Scale 1:20000
19
20
21
23
24
25
26
28
29
30
31
32
33
35
36

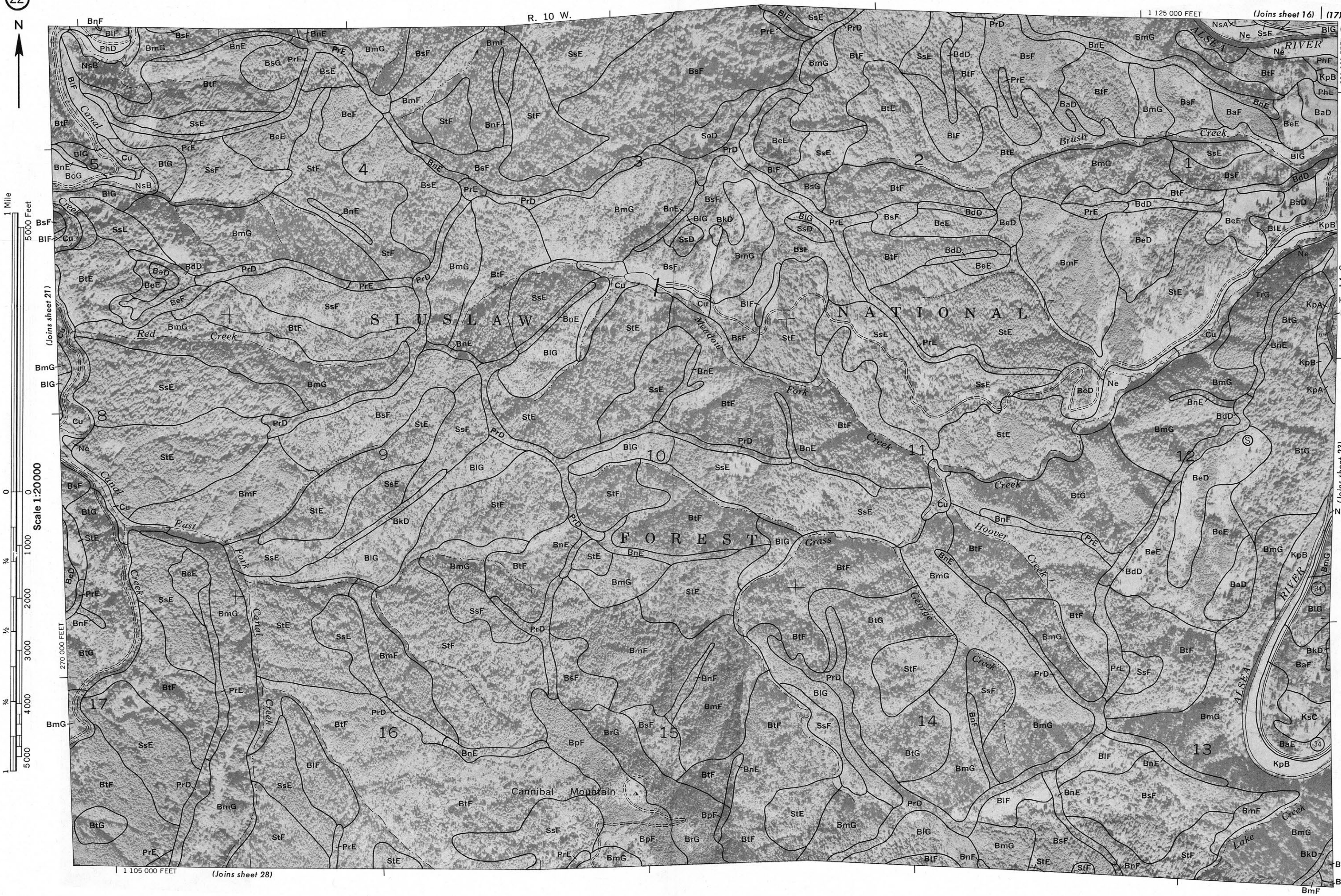

19
N
1 175 000 FEET
295 000 FEET
LINCOLN COUNTY
BENTON COUNTY
(Joins sheet 12)
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 24)
(Joins sheet 25)
T. 13 S.
R. 8 W.
R. 7 W.
1 195 000 FEET
285 000 FEET
S I U S L A W N A T I O N A L F O R E S T
NORTH FORK ALSEA RIVER
Slick Creek
Mill Creek
Peak Creek
Schoolhouse Cr.
Bailey Cr.
1 Mile
5000 Feet
Scale 1:20000

ALSEA AREA, OREGON — SHEET NUMBER 1


N
(Joins sheet 13)
R. 7 W.
1 220 000 FEET
290 000 FEET
T. 13 S.
(Joins sheet 19)
(Joins inset B, sheet 33)
280 000 FEET
1 205 000 FEET
(Joins sheet 25)
(Joins sheet 26)
1 Mile
5000 Feet
Scale 1:20 000
0
1000
2000
3000
4000
5000
¼
½
¾
1
SIUSLAW NATIONAL FOREST
STATE FISH HATCH
ALSEA RIVER
NORTH FORK
Bailey Cr.
Baker Creek
Crooked Creek
Ernest Creek
Seeley Creek
Peak Creek
Flat Mtn
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36


(Joins 14)
1 080 000 FEET
(Joins sheet 15)
R. 11 W.
R. 10 W.
N
280 000 FEET
T. 14 S.
(Joins inset, sheet 27)
(Joins sheet 22)
(Joins sheet 27)
(Joins sheet 27)
1 100 000 FEET
270 000 FEET
Scale 1:20000
1 Mile
5000 Feet
0
¼
½
¾
1
1000
2000
3000
4000
5000
SIUSLAW
NATIONAL
FOREST
Burnt Timber Mountain
Crotchline Saddle
Desolation Saddle
Darkey Creek
Creek
Onstable Creek
Arnold Creek
Sudan
Bear Creek
West
Skinner Creek
Canal Creek
1
2
3
4
5
6
7
9
10
11
12
17
18

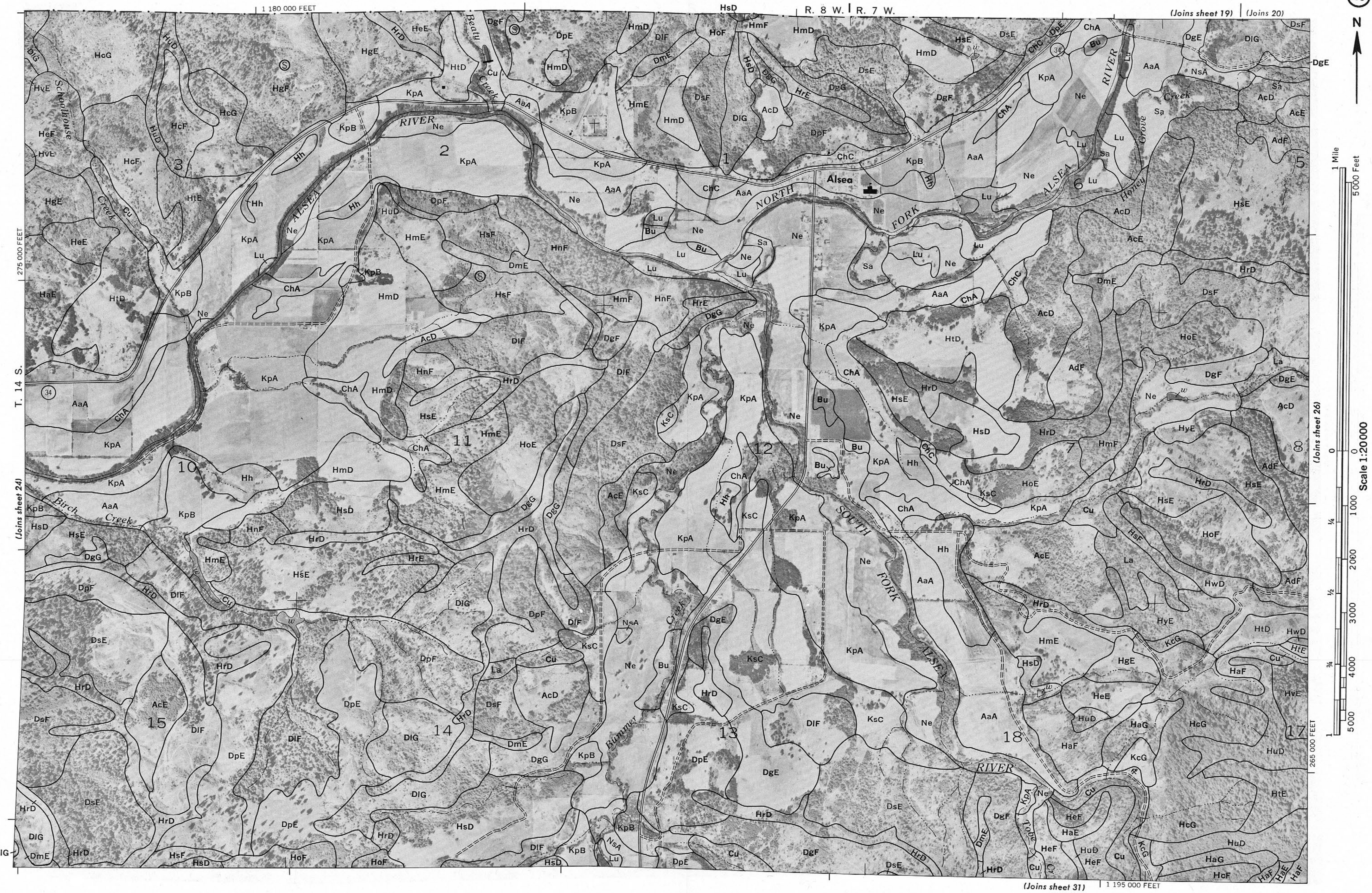
ALSEA AREA, OREGON — SHEET NUMBER 22



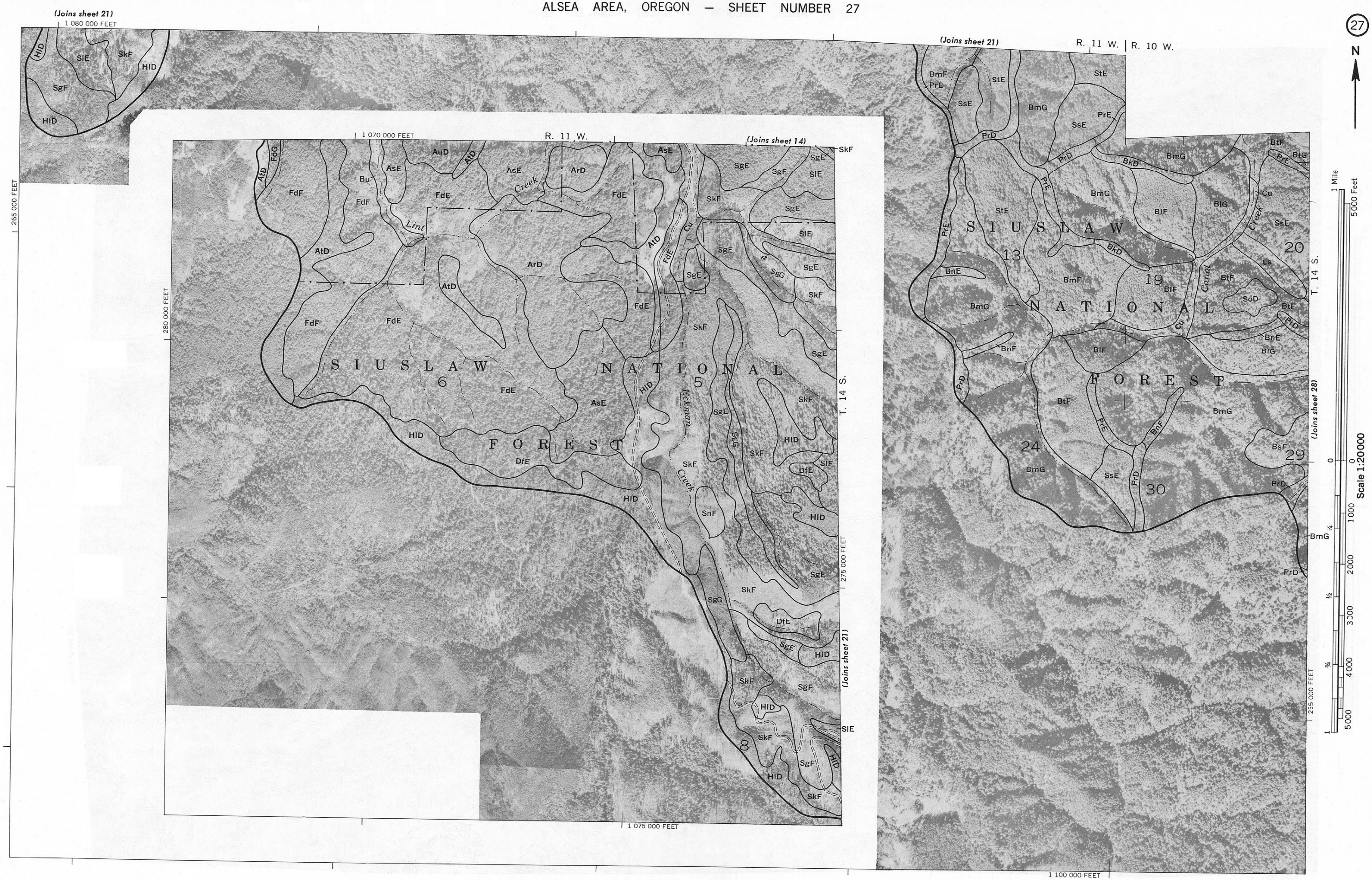
ALSEA AREA, OREGON — SHEET NUMBER 23


N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 18)
(Joins sheet 19)
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 30)
1 170 000 FEET
280 000 FEET
265 000 FEET
1 155 000 FEET
R. 9 W.
R. 8 W.
T. 14 S.
SIUSLAW
NATIONAL
FOREST
LINCOLN COUNTY
BENTON COUNTY
ALSEA RIVER
Skunk Cr
Fall Creek
Digger Creek
Cow Creek
Benner Creek
Maltby Creek
Digger Mountain

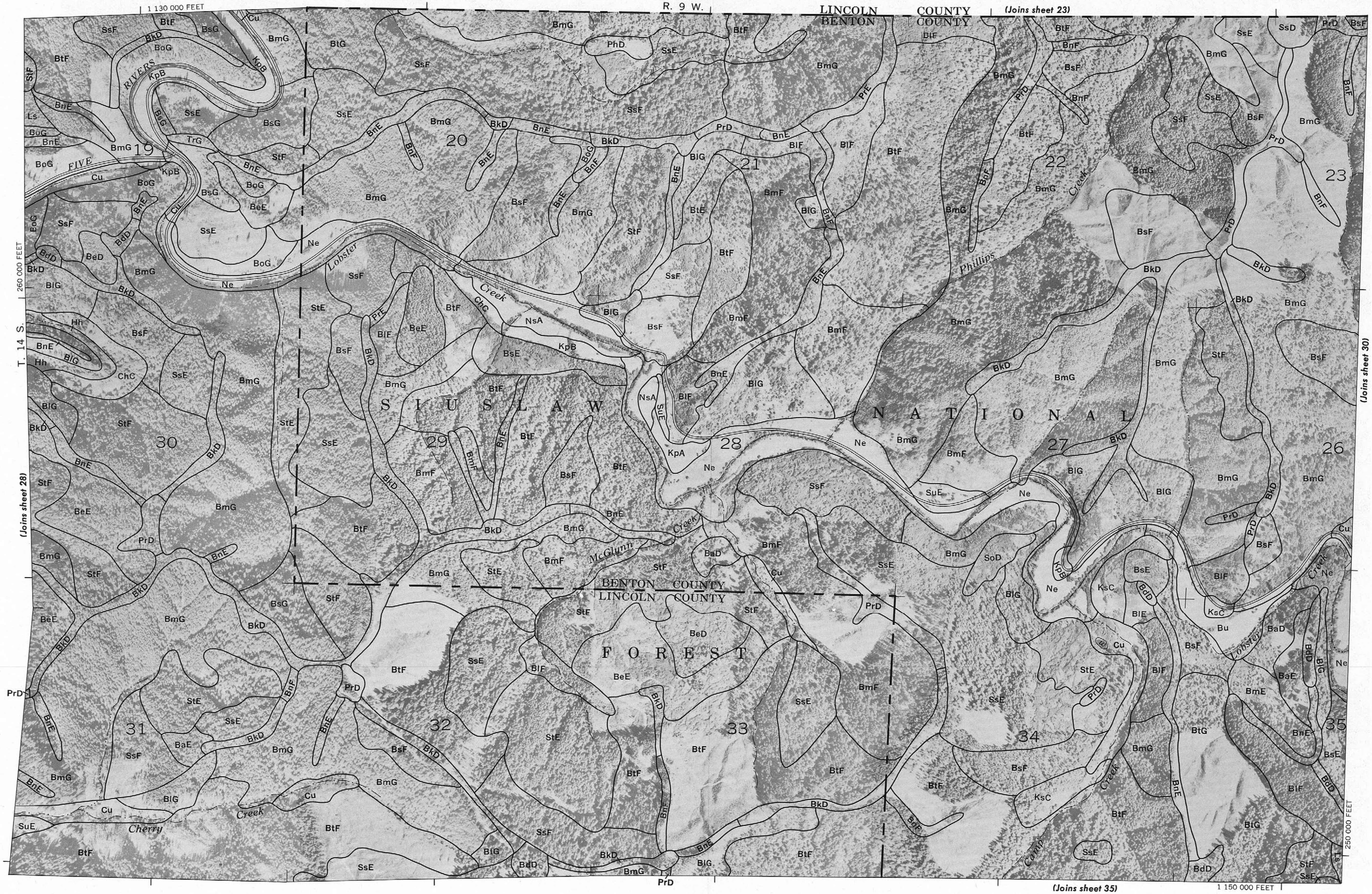
ALSEA AREA, OREGON — SHEET NUMBER 25




N
R. 7 W.
1 220 000 FEET
(Joins sheet 20)
(Joins inset B, sheet 33)
275 000 FEET
T. 14 S.
(Joins inset A, sheet 33)
(Joins sheet 25)
(Joins sheet 32)
1 200 000 FEET
265 000 FEET
Scale 1:20000
1 Mile
5000 Feet
Honey
Grove
Creek
Buck Peak
Peak
Creek
Trout


(Joins sheet 21)
1 080 000 FEET
1 070 000 FEET
R. 11 W.
(Joins sheet 14)
(Joins sheet 21)
R. 11 W. | R. 10 W.
27
N
265 000 FEET
280 000 FEET
275 000 FEET
255 000 FEET
1 075 000 FEET
1 100 000 FEET
T. 14 S.
(Joins sheet 21)
(Joins sheet 28)
SIUSLAW NATIONAL FOREST
SIUSLAW NATIONAL FOREST
Lint Creek
Eckman Creek
Creek
Canal
6
5
8
13
19
20
24
29
30
1 Mile
5000 Feet
Scale 1:20000


N
(Joins sheet 22)
R. 10 W.
1 125 000 FEET
265 000 FEET
(Joins sheet 27)
T. 14 S.
(Joins sheet 29)
255 000 FEET
1 105 000 FEET
(Joins sheet 34)
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
¼
½
¾
1
SIUSLAW NATIONAL FOREST
Cannibal Mtn
Spring
East Fork Canal Creek
Lake Creek
Five Rivers
Swamp Creek
North Fork
Cascade Creek
Wilson Creek
McDonald Cr.
Buck Creek
Cherry Creek
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36



N

1 Mile

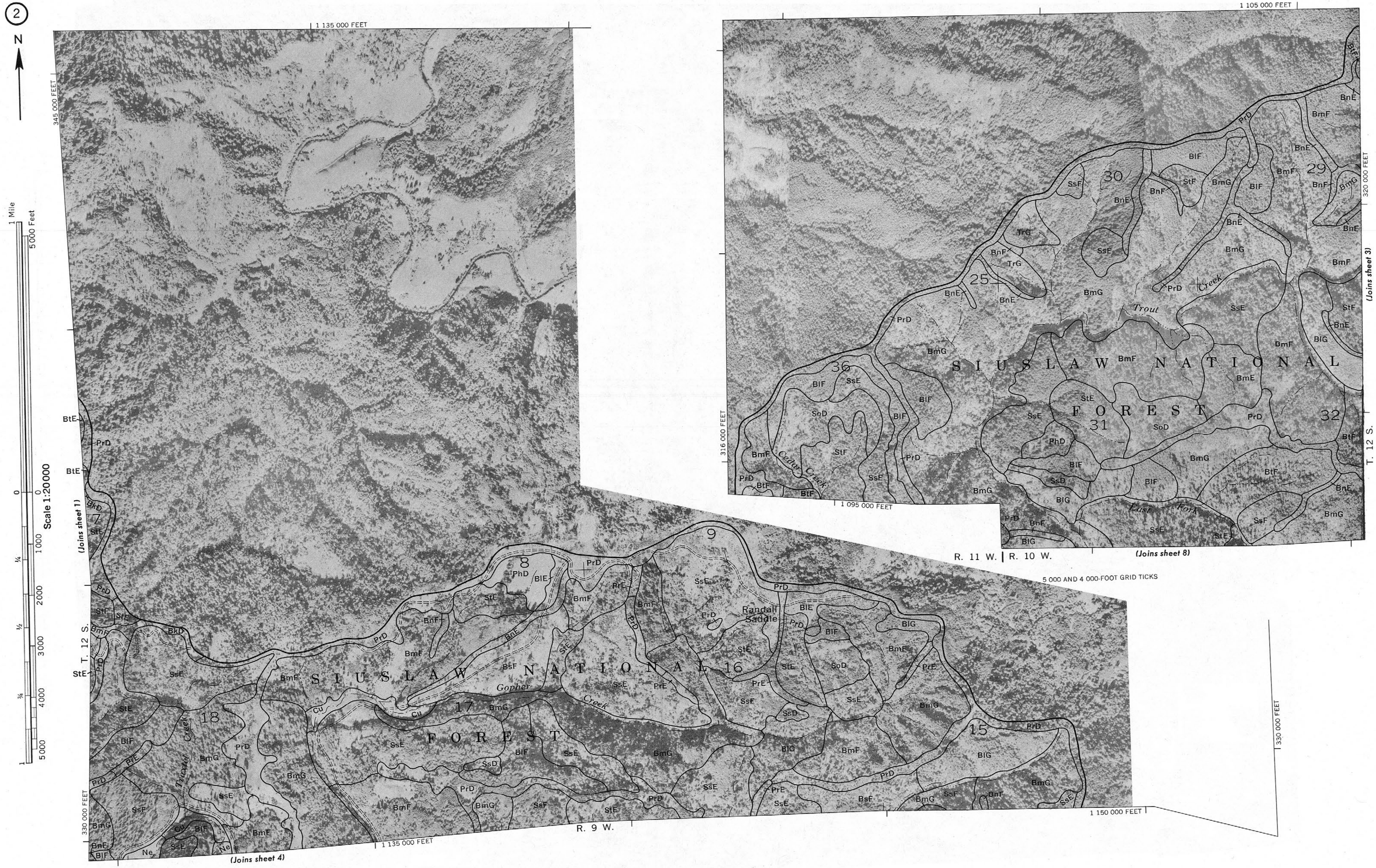
5000 Feet

Scale 1:20000

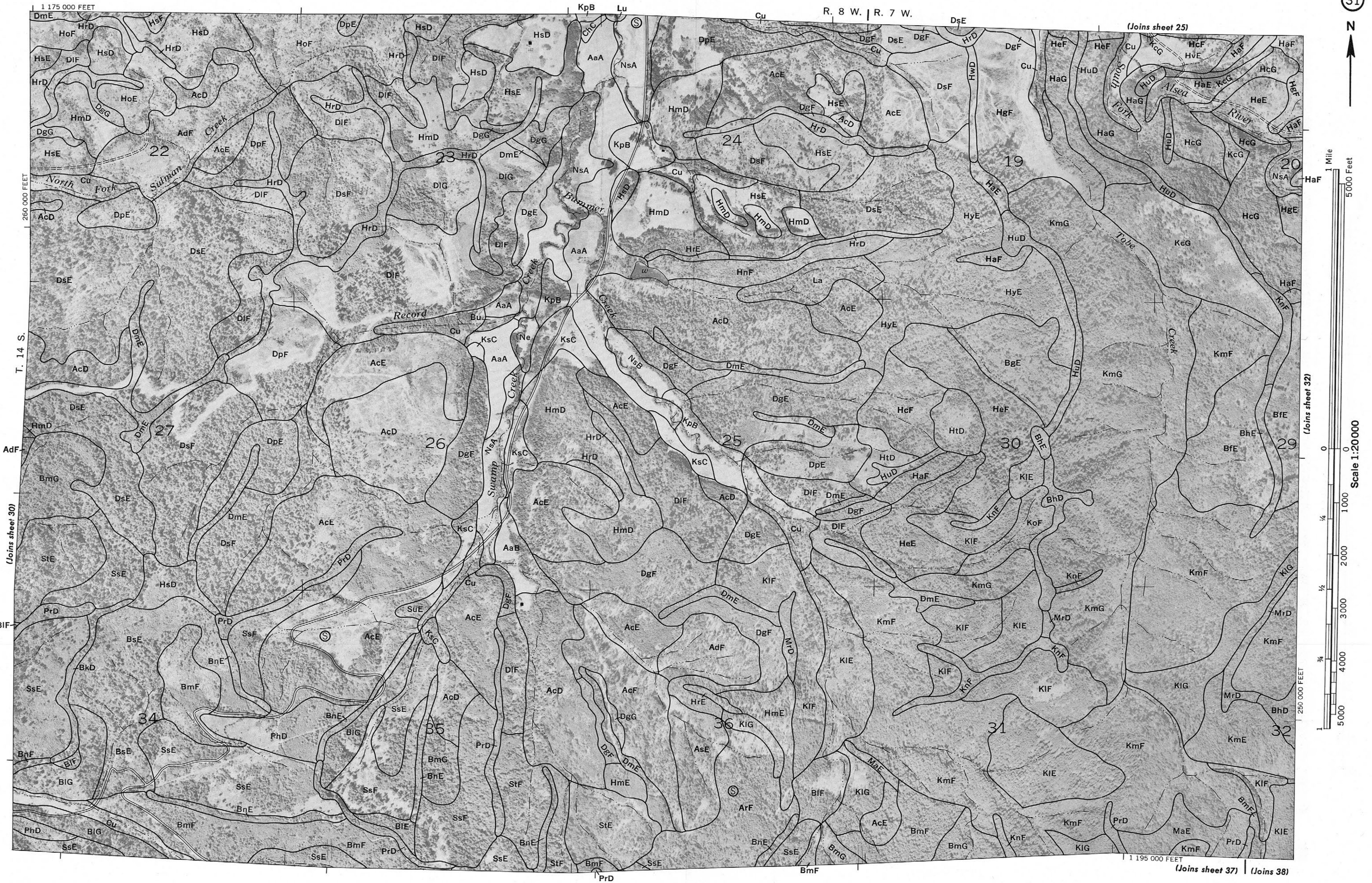
0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

ALSEA AREA, OREGON — SHEET NUMBER 2



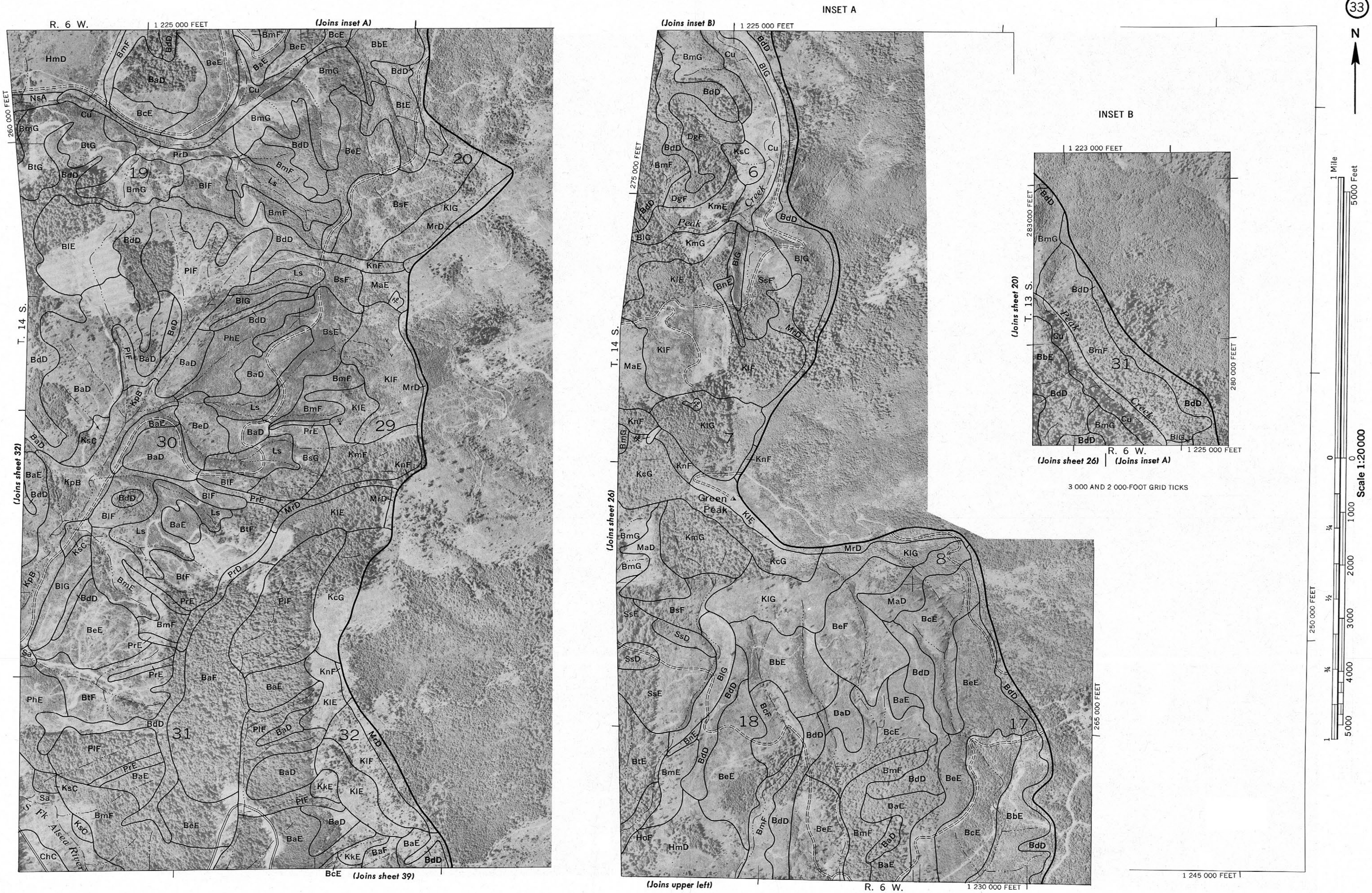

N
LINCOLN COUNTY
BENTON COUNTY
(Joins sheet 24)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 36)
1 170 000 FEET
260 000 FEET
250 000 FEET
1 155 000 FEET
R. 9 W. | R. 8 W.
T. 14 S.
1 Mile
5000 Feet
Scale 1:20000
SIUSLAW
NATIONAL
FOREST
ALSEA RIVER
Missouri Bend School
Sulmon Creek
North Fork
South Fork
Wilkinson Creek
Lobster Creek
Little Lobster Creek
Briar Creek
19
20
21
23
24
25
26
28
29
30
31
32
33
35
36

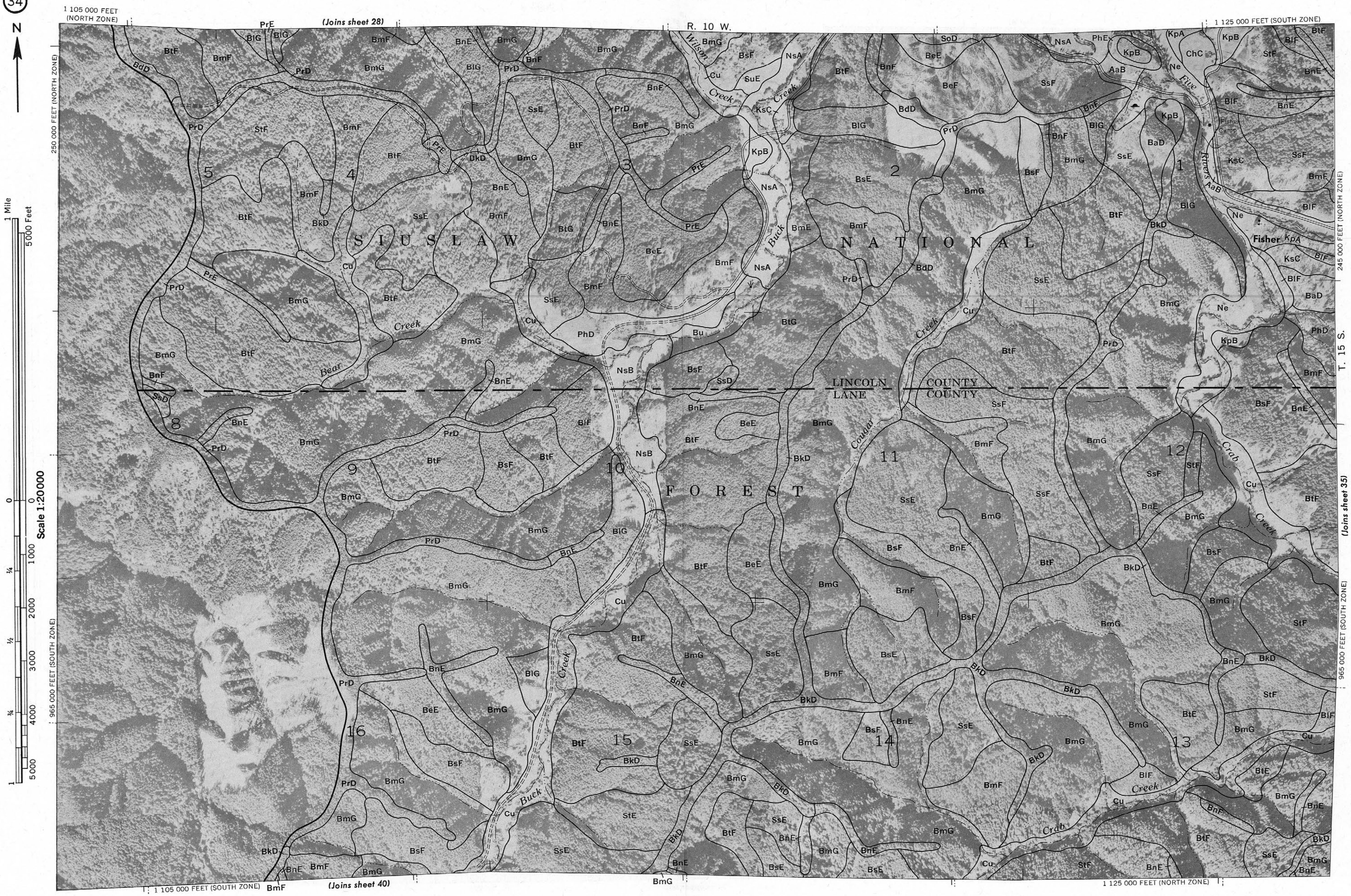


31
N
1 175 000 FEET
R. 8 W. | R. 7 W.
(Joins sheet 25)
260 000 FEET
T. 14 S.
(Joins sheet 30)
(Joins sheet 32)
250 000 FEET
1 195 000 FEET
(Joins sheet 37) | (Joins 38)
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
¼
½
¾
1
North Fork Sulman Creek
Bummer Creek
Record Creek
Swamp Creek
South Fork Alsea River
Tobe Creek
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32

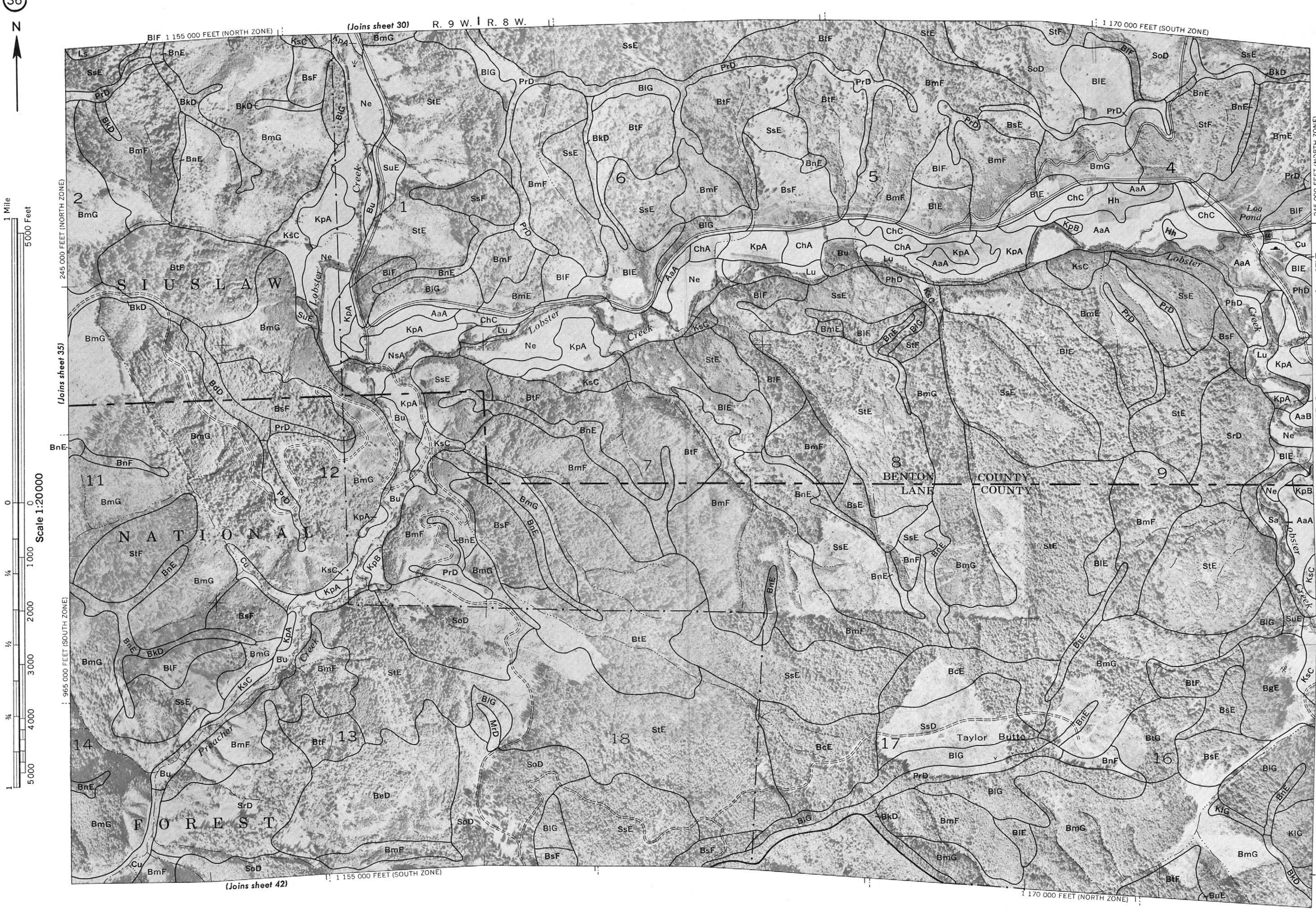

N
(Joins sheet 26)
R. 7 W.
1 220 000 FEET
260 000 FEET
T. 14 S.
(Joins sheet 33)
(Joins sheet 38)
1 200 000 FEET
250 000 FEET
(Joins sheet 31)
1 Mile
5000 Feet
Scale 1:20000
South Fork Alsea River
Trout Creek
Peak Creek
Rock Creek
Fall Creek
Williams Cr.
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36

ALSEA AREA, OREGON — SHEET NUMBER 33




34
N
1 105 000 FEET (NORTH ZONE)
(Joins sheet 28)
R. 10 W.
1 125 000 FEET (SOUTH ZONE)
250 000 FEET (NORTH ZONE)
245 000 FEET (NORTH ZONE)
965 000 FEET (SOUTH ZONE)
T. 15 S.
(Joins sheet 35)
1 105 000 FEET (SOUTH ZONE)
(Joins sheet 40)
1 125 000 FEET (NORTH ZONE)
1 Mile
5000 Feet
Scale 1:20000
SIUSLAW NATIONAL FOREST
LINCOLN COUNTY
LANE COUNTY
Wilson Creek
Buck Creek
Bear Creek
Cougar Creek
Crab Creek
Five Rivers
Fisher
Fish Camp

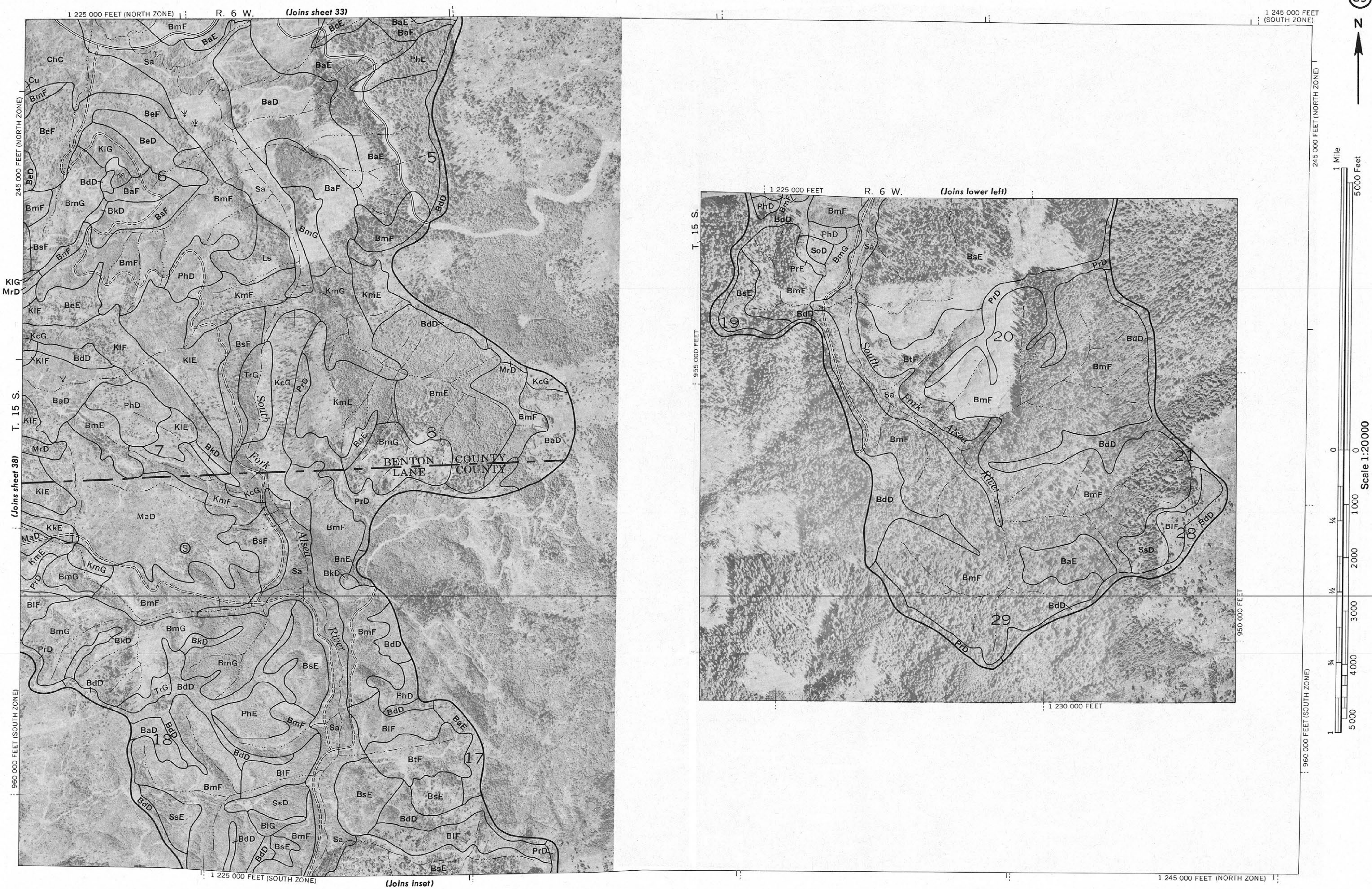

35
N
1 130 000 FEET (NORTH ZONE)
R. 9 W.
(Joins sheet 29)
1 150 000 FEET (SOUTH ZONE)
T. 15 S.
245 000 FEET (NORTH ZONE)
245 000 FEET (NORTH ZONE)
965 000 FEET (SOUTH ZONE)
965 000 FEET (SOUTH ZONE)
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 41)
1 130 000 FEET (SOUTH ZONE)
1 150 000 FEET (NORTH ZONE)
SIUSLAW NATIONAL FOREST
LANE COUNTY
LANE COUNTY
LINCOLN COUNTY
BENTON COUNTY
Dense Ridge
Alder Creek
Crazy Creek
Camp Creek
Fendall Creek
Five Rivers
Cedar Creek
Crab Creek
Green River
Ryan Creek
Summer Creek
Scale 1:20000
1 Mile
5000 Feet
0
¼
½
¾
1
1000
2000
3000
4000
5000


N
(Joins sheet 30)
R. 9 W. | R. 8 W.
1 155 000 FEET (NORTH ZONE)
1 170 000 FEET (SOUTH ZONE)
245 000 FEET (NORTH ZONE)
965 000 FEET (SOUTH ZONE)
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 42)
1 155 000 FEET (SOUTH ZONE)
1 170 000 FEET (NORTH ZONE)
T. 15 S.
SIUSLAW
NATIONAL
FOREST
BENTON COUNTY
LANE COUNTY
Lobster Creek
Preacher Creek
Log Pond
Taylor Butte
1 Mile
5000 Feet
Scale 1:20000
0
¼
½
¾
1
0
1000
2000
3000
4000
5000

ALSEA AREA, OREGON — SHEET NUMBER 37

37


(Joins 31) | (Joins sheet 32)
(Joins sheet 37)
(Joins sheet 39)
N
1 200 000 FEET (NORTH ZONE)
1 220 000 FEET (SOUTH ZONE)
245 000 FEET (NORTH ZONE)
960 000 FEET (SOUTH ZONE)
1 200 000 FEET (SOUTH ZONE)
R. 7 W.
T. 15 S.
Prairie Mountain
Williams Creek
BENTON COUNTY
LANE CO.
1 Mile
5000 Feet
Scale 1:20000
0
¼
½
¾
1
1000
2000
3000
4000
5000



39
N
1 225 000 FEET (NORTH ZONE)
R. 6 W.
(Joins sheet 33)
1 245 000 FEET (SOUTH ZONE)
245 000 FEET (NORTH ZONE)
T. 15 S.
(Joins sheet 38)
960 000 FEET (SOUTH ZONE)
1 225 000 FEET (SOUTH ZONE)
(Joins inset)
1 245 000 FEET (NORTH ZONE)
BENTON COUNTY
LANE COUNTY
South Fork Alsea River
1 225 000 FEET
R. 6 W.
(Joins lower left)
T. 15 S.
955 000 FEET
950 000 FEET
1 230 000 FEET
1 Mile
5000 Feet
Scale 1:20000
0
¼
½
¾
1
1000
2000
3000
4000
5000

ALSEA AREA, OREGON — SHEET NUMBER 3

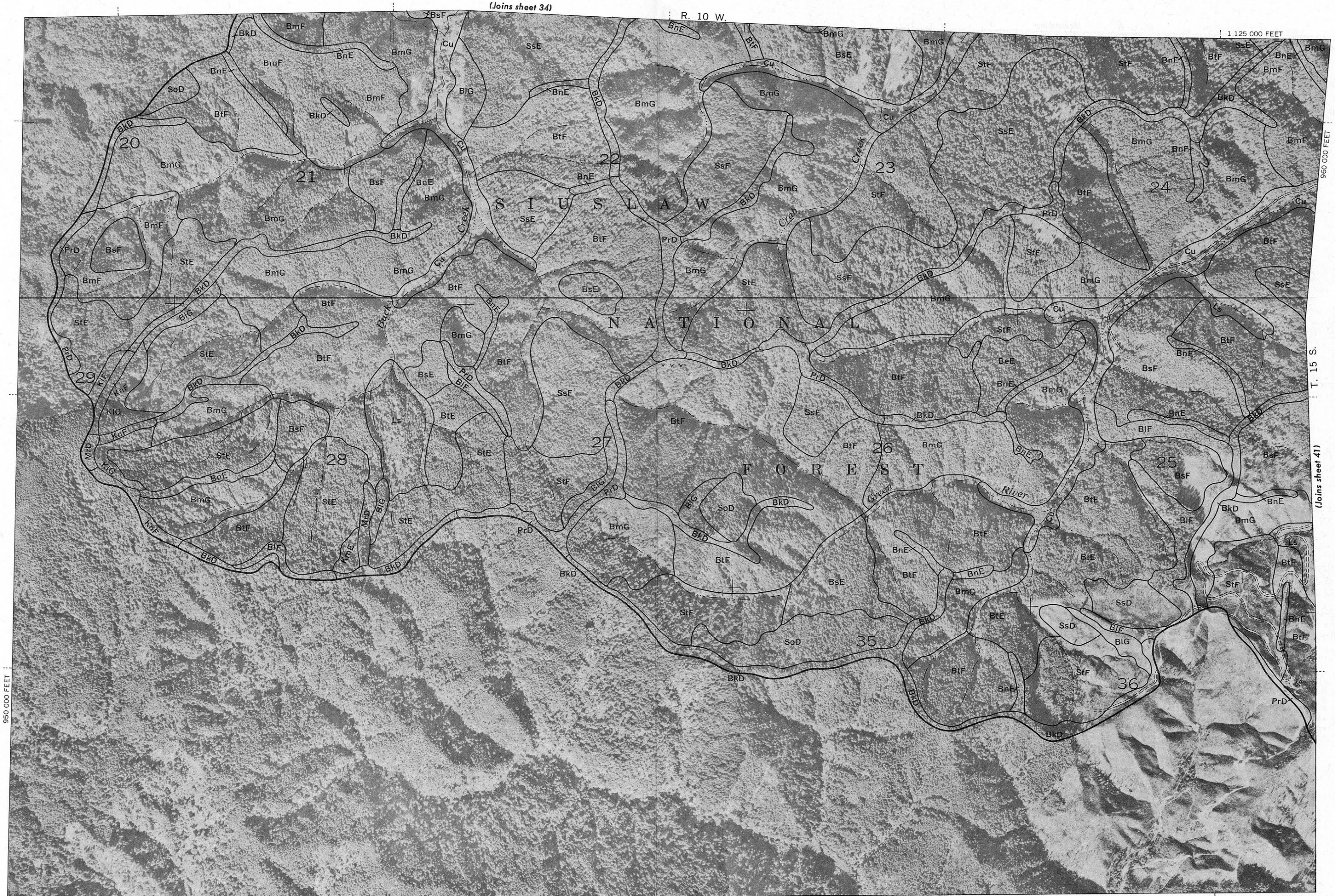
3

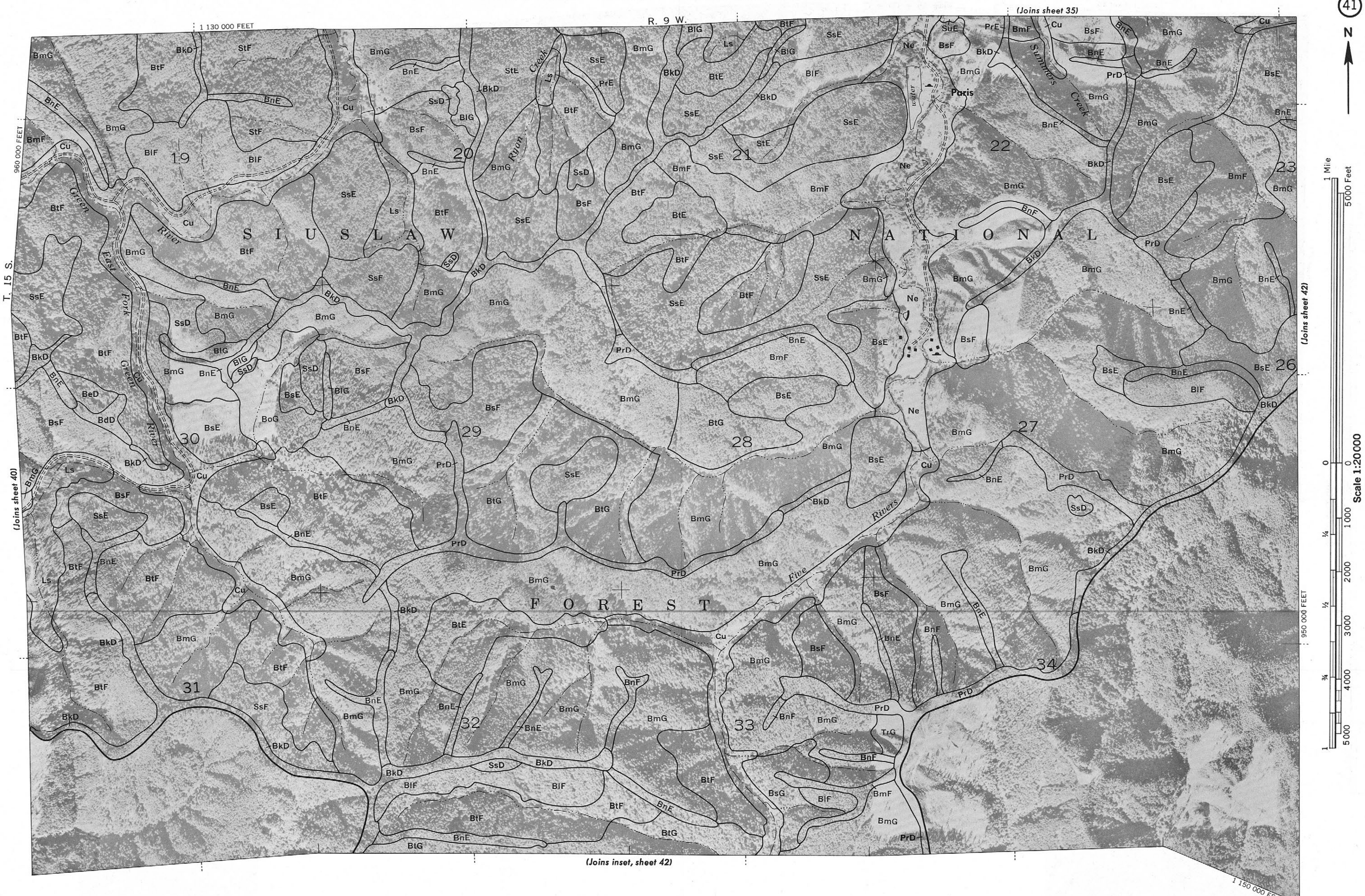
(40)

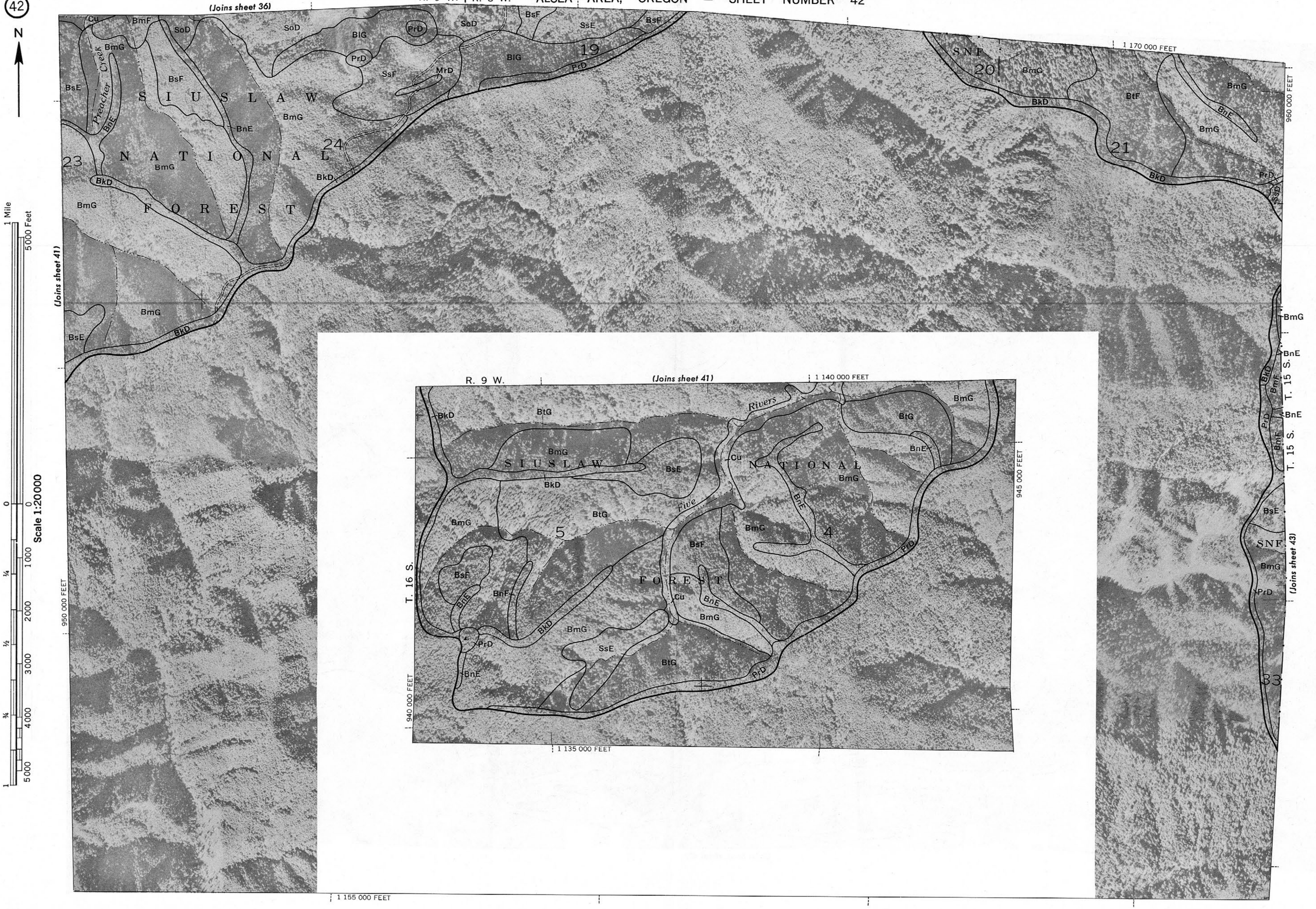
ALSEA AREA, OREGON — SHEET NUMBER 40

N

1 Mile
5000 Feet
0
0
1000
¼
2000
½
3000
4000
¾
5000
1
Scale 1:20000

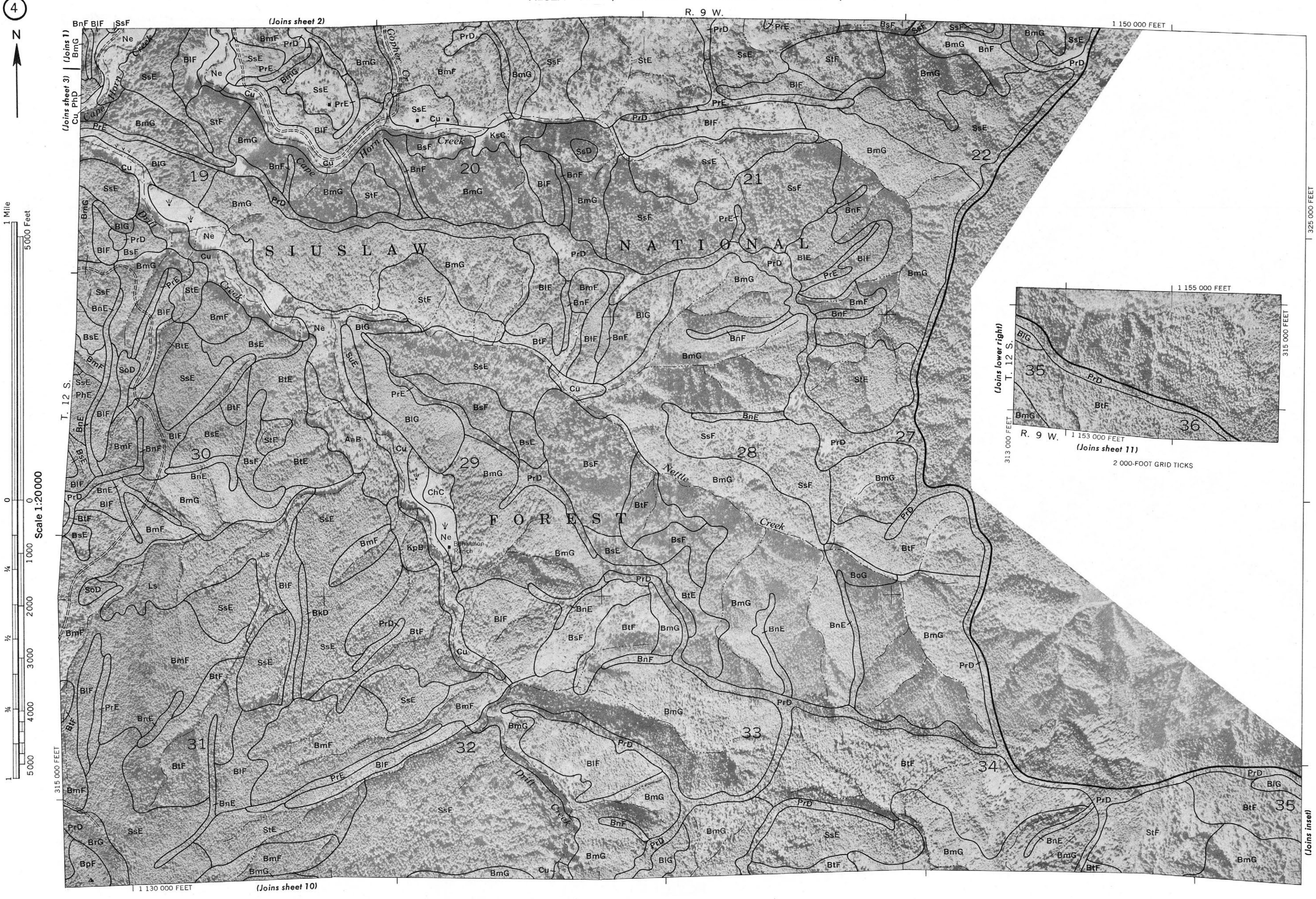



41
N
(Joins sheet 35)
R. 9 W.
1 130 000 FEET
960 000 FEET
T. 15 S.
(Joins sheet 40)
(Joins sheet 42)
(Joins inset, sheet 42)
950 000 FEET
1 150 000 FEET
S I U S L A W
N A T I O N A L
F O R E S T
Paris
Green River
East Fork Green River
Ryan Creek
Summers Creek
Five Rivers
19
20
21
22
23
26
27
28
29
30
31
32
33
34
1 Mile
5000 Feet
Scale 1:20000


(Joins sheet 36)
(Joins sheet 41)
(Joins sheet 41)
(Joins sheet 43)
N
1 Mile
5000 Feet
Scale 1:20000
1 170 000 FEET
960 000 FEET
950 000 FEET
945 000 FEET
940 000 FEET
1 140 000 FEET
1 135 000 FEET
1 155 000 FEET
SIUSLAW NATIONAL FOREST
Preacher Creek
Five Rivers
R. 9 W.
T. 15 S.
T. 16 S.
SNF
19
20
21
23
24
33
5
4
BmF
SoD
BlG
PrD
SsE
BsF
BmG
BsE
BnE
BkD
MrD
SsF
BtF
BtG
BnF
Cu


R. 8 W. | R. 7 W.
43
N
1 175 000 FEET
960 000 FEET
(Joins sheet 37)
(Joins sheet 42)
(Joins inset)
T. 15 S.
East Fork Lobster Creek
Lobster Creek
South Fork Lobster Creek
19
22
23
24
25
26
27
30
31
34
35
36
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
¼
½
¾
1
(Joins lower left)
R. 8 W.
1 183 000 FEET
943 000 FEET
945 000 FEET
T. 16 S.
942 000 FEET
1 180 000 FEET
3 000 AND 1 000-FOOT GRID TICKS
1 195 000 FEET
2
1

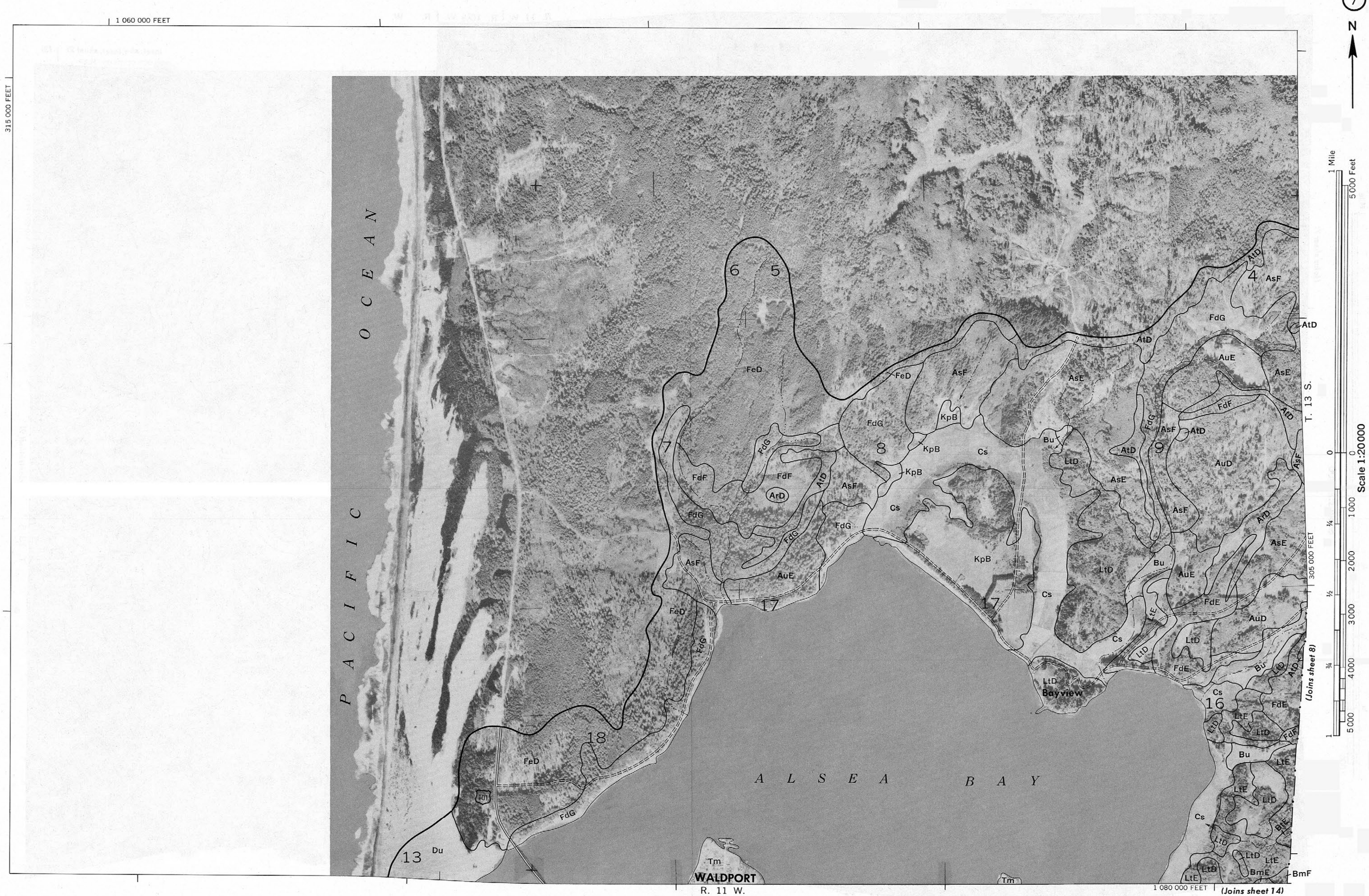
ALSEA AREA, OREGON — SHEET NUMBER 4

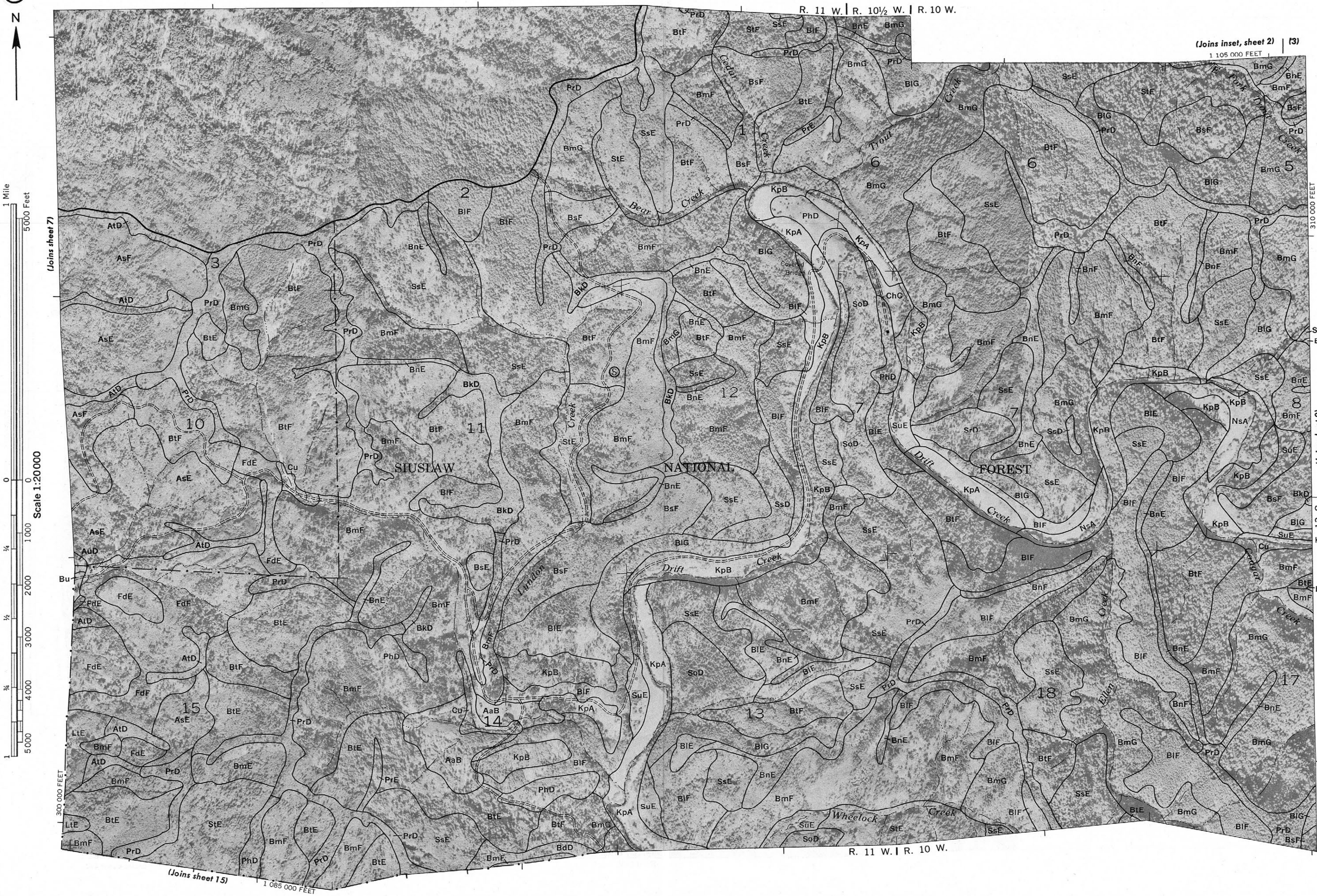


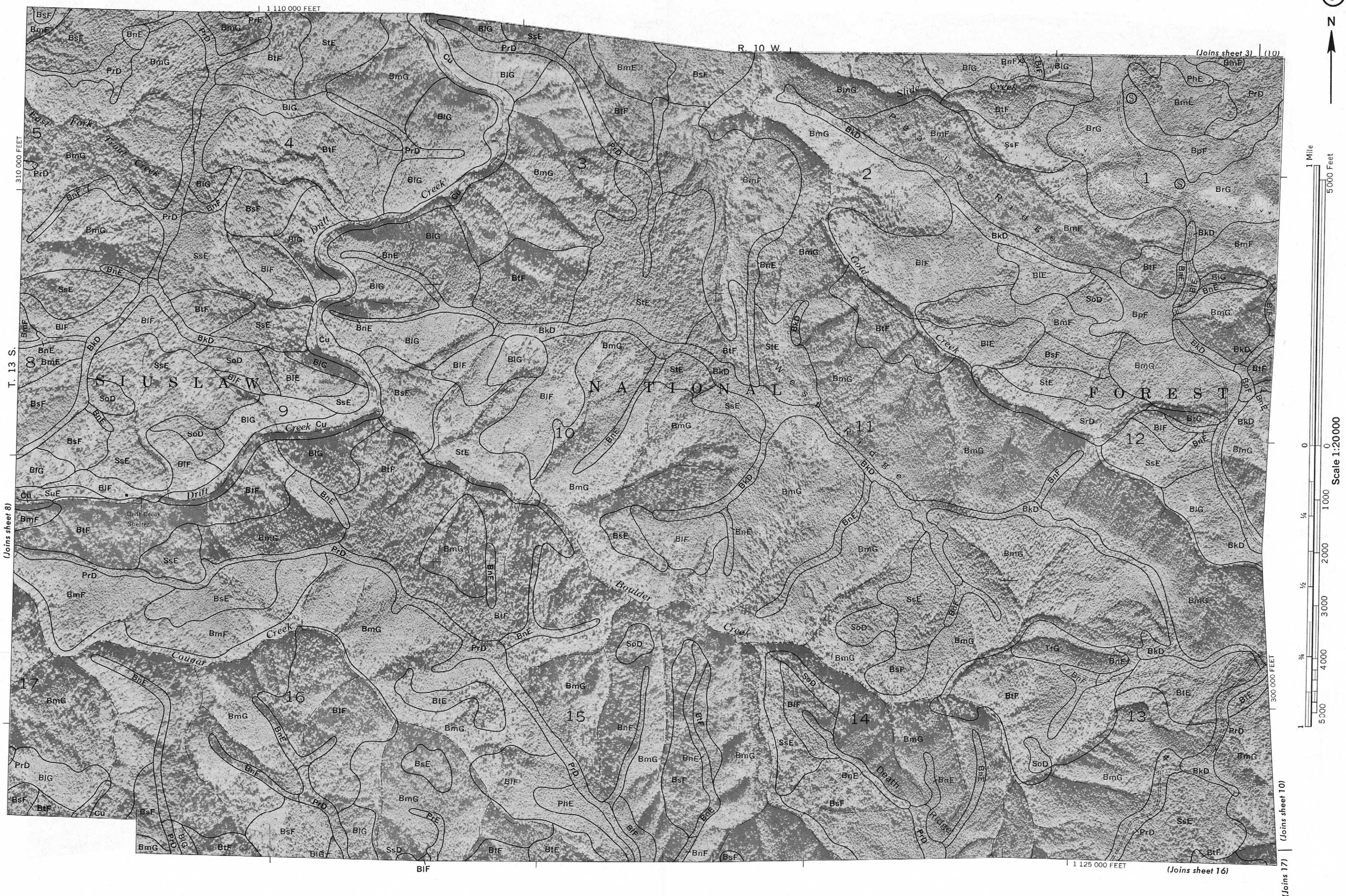

5
N
1 180 000 FEET
325 000 FEET
T. 12 S.
(Joins inset, sheet 6)
(Joins sheet 6)
(Joins sheet 12)
R. 8 W. | R. 7 W.
1 195 000 FEET
315 000 FEET
Scale 1:20000
1 Mile
5000 Feet
CORVALLIS
WATERSHED
WILD ANIMAL
GAME REFUGE
SIUSLAW
NATIONAL
FOREST
LINCOLN COUNTY
BENTON COUNTY
Sweethome
Creek
Parker
Creek
19
20
25
26
27
29
30
31
32
34
35
36
BmF
BlE
BaD
BnE
PrD
PhE
PrE
BlG
BnE
StE
BlF
SoD
SsE
BsF
BmF
BsE
BaD
Cu
KpE
NsA
Ne
BtE
Ls
BoG
BnF
SrD
AsE
BdD
KlE
BsE
BtE
BmG
BnG
SsE
BtF
KnF
KoF
KlF
KlG
KmG
MrD
BhD
KmF
KkE
BfE
MuD
MuF
KcG
TrG
KnF
BhE

ALSEA AREA, OREGON — SHEET NUMBER 6

ALSEA AREA, OREGON — SHEET NUMBER 7




8
N
1 Mile
5000 Feet
Scale 1:20000
R. 11 W. | R. 10½ W. | R. 10 W.
R. 11 W. | R. 10 W.
T. 13 S.
(Joins inset, sheet 2)
(3)
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 15)
1 105 000 FEET
310 000 FEET
300 000 FEET
1 085 000 FEET
SIUSLAW
NATIONAL
FOREST
Bear Creek
Cedar Creek
Trout Creek
Drift Creek
Lundon Creek
Ellen Creek
Wheelock Creek
Covered Bridge
East Fork Drift Creek


9
N
1 110 000 FEET
R. 10 W.
(Joins sheet 3)
(10)
310 000 FEET
T. 13 S.
(Joins sheet 8)
(Joins sheet 10)
(Joins sheet 16)
(Joins 17)
1 125 000 FEET
300 000 FEET
1 Mile
5000 Feet
Scale 1:20000
S I U S L A W
N A T I O N A L
F O R E S T
East Fork Trout Creek
Drift Creek
Cougar Creek
Boulder Creek
Slide Creek
Cold Creek
Peavine Ridge
West Ridge
Death Ridge
Drift Creek Shelter

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs. In referring to a capability unit or forest management group, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Acreage and extent, table 1, page 5.

Engineering uses of the soils, tables 2, 3, and 4, pages 48 through 61.

Map symbol	Mapping unit	Page	Capability unit: Symbol	Capability unit: Page	Forest management group: Number	Forest management group: Page
AaA	Alsea loam, 0 to 3 percent slopes	6	IIw-1	37	----	----
AaB	Alsea loam, 3 to 8 percent slopes	7	IIIw-1	38	----	----
AcD	Apt clay, 5 to 25 percent slopes	7	IVe-1	39	2	43
AcE	Apt clay, 25 to 37 percent slopes	8	VIe-1	40	2	43
AcF	Apt clay, 37 to 50 percent slopes	8	VIe-5	41	4	43
AdF	Apt clay, dissected, 25 to 45 percent slopes	8	VIe-1	40	4	43
ArD	Astoria clay loam, dissected, 5 to 25 percent slopes	8	VIe-3	40	3	43
ArE	Astoria clay loam, dissected, 25 to 37 percent slopes	9	VIe-3	40	3	43
ArF	Astoria clay loam, dissected, 37 to 50 percent slopes	9	VIe-3	40	3	43
AsE	Astoria clay loam, dissected uneven, 25 to 37 percent slopes	9	VIe-3	40	4	43
AsF	Astoria clay loam, dissected uneven, 37 to 50 percent slopes	9	VIe-3	40	4	43
AtD	Astoria clay loam, ridge, 0 to 25 percent slopes	9	VIe-3	40	6	44
AuD	Astoria clay loam, uneven, 10 to 25 percent slopes	9	VIe-3	40	6	44
AuE	Astoria clay loam, uneven, 25 to 37 percent slopes	9	VIe-3	40	6	44
BaD	Blachly clay loam, 0 to 25 percent slopes	11	VIe-1	40	1	43
BaE	Blachly clay loam, 25 to 37 percent slopes	11	VIe-1	40	1	43
BaF	Blachly clay loam, 37 to 50 percent slopes	11	VIe-5	41	1	43
BbE	Blachly clay loam, dissected, 25 to 40 percent slopes	11	VIe-1	40	3	43
BcE	Blachly clay loam, dissected uneven, 25 to 37 percent slopes	11	VIe-1	40	4	43
BcF	Blachly clay loam, dissected uneven, 37 to 50 percent slopes	11	VIe-5	41	4	43
BdD	Blachly clay loam, ridge, 0 to 25 percent slopes	11	VIe-1	40	1	43
BeD	Blachly clay loam, uneven, 10 to 25 percent slopes	11	VIe-1	40	2	43
BeE	Blachly clay loam, uneven, 25 to 37 percent slopes	10	VIe-1	40	2	43
BeF	Blachly clay loam, uneven, 37 to 50 percent slopes	11	VIe-5	41	4	43
BfE	Blachly clay loam, basalt substratum, uneven, 25 to 37 percent slopes	10	VIe-1	40	1	43
BgE	Blachly clay loam, basalt substratum, dissected, 25 to 37 percent slopes	11	VIe-1	40	4	43
BhD	Blachly clay loam, basalt substratum, ridge, 5 to 25 percent slopes	11	VIe-1	40	1	43
BhE	Blachly clay loam, basalt substratum, ridge, 25 to 37 percent slopes	12	VIe-1	40	1	43
BkD	Bohannon loam, ridge, 5 to 25 percent slopes	12	VIe-2	40	7	44
BlE	Bohannon gravelly loam, 5 to 35 percent slopes	12	VIe-2	40	7	44
BlF	Bohannon gravelly loam, 35 to 50 percent slopes	12	VIe-5	41	8	44
BlG	Bohannon gravelly loam, 50 to 75 percent slopes	12	VIIe-2	41	10	45
BmE	Bohannon gravelly loam, dissected, 25 to 37 percent slopes	13	VIe-2	40	9	45
BmF	Bohannon gravelly loam, dissected, 37 to 50 percent slopes	13	VIe-5	41	9	45
BmG	Bohannon gravelly loam, dissected, 50 to 90 percent slopes	12	VIIe-2	41	10	45
BnE	Bohannon gravelly loam, ridge, 25 to 37 percent slopes	13	VIe-2	40	7	44
BnF	Bohannon gravelly loam, ridge, 37 to 50 percent slopes	13	VIe-5	41	8	44
BoG	Bohannon rocky loam, 75 to 100 percent slopes	13	VIIs-1	42	10	45
BpF	Bohannon gravelly loam, syenite substratum, 5 to 50 percent slopes	13	VIe-2	40	7	44
BrG	Bohannon gravelly loam, syenite substratum, dissected, 50 to 75 percent slopes	13	VIIe-2	41	11	45
BsE	Bohannon-Slickrock gravelly loams, 25 to 35 percent slopes	13	VIe-2	40	7	44
BsF	Bohannon-Slickrock gravelly loams, 35 to 50 percent slopes	13	VIe-5	41	8	44
BsG	Bohannon-Slickrock gravelly loams, 50 to 75 percent slopes	13	VIIe-2	41	10	45
BtE	Bohannon-Slickrock gravelly loams, dissected, 25 to 37 percent slopes	13	VIe-2	40	9	45
BtF	Bohannon-Slickrock gravelly loams, dissected, 37 to 50 percent slopes	13	VIe-5	41	9	45
BtG	Bohannon-Slickrock gravelly loams, dissected, 50 to 75 percent slopes	13	VIIe-2	41	11	45
Bu	Brenner silt loam	14	IIIw-3	39	----	----
ChA	Chitwood silt loam, 0 to 3 percent slopes	14	IIw-3	37	----	----
ChC	Chitwood silt loam, 3 to 13 percent slopes	15	IIIw-1	38	----	----
Cs	Clatsop silty clay loam	15	VIw-1	41	----	----
Cu	Colluvial and Alluvial land	16	VIe-1	40	5	44
De	Depoe silt loam	16	VIw-2	41	6	44
DfE	Desolation clay loam, 10 to 35 percent slopes	17	VIe-3	40	2	43
DgE	Digger gravelly loam, 20 to 37 percent slopes	18	VIe-2	40	7	44
DgF	Digger gravelly loam, 37 to 50 percent slopes	18	VIe-5	41	8	44
DgG	Digger gravelly loam, 50 to 75 percent slopes	18	VIIe-2	41	10	45
DlF	Digger gravelly loam, dissected, 37 to 50 percent slopes	18	VIe-5	41	9	45
DlG	Digger gravelly loam, dissected, 50 to 75 percent slopes	17	VIIe-2	41	12	45
DmE	Digger gravelly loam, ridge, 5 to 37 percent slopes	18	VIe-2	40	7	44
DpE	Digger-Apt complex, 25 to 37 percent slopes	18	VIe-2	40	7	44
DpF	Digger-Apt complex, 37 to 60 percent slopes	18	VIe-5	41	8	44
DsE	Digger-Apt complex, dissected, 25 to 37 percent slopes	18	VIe-2	40	9	45
DsF	Digger-Apt complex, dissected, 37 to 60 percent slopes	18	VIe-5	41	9	45
Du	Dune land	18	VIIIs-1	42	----	----
FdE	Fendall gravelly clay loam, 25 to 37 percent slopes	19	VIe-3	40	6	44
FdF	Fendall gravelly clay loam, 37 to 50 percent slopes	18	VIe-3	40	6	44
FdG	Fendall gravelly clay loam, 50 to 75 percent slopes	19	VIIe-1	41	11	45
FeD	Ferrelo loam, 5 to 30 percent slopes	19	VIe-3	40	13	46
HaE	Hatchery gravelly loam, 25 to 37 percent slopes	20	VIe-2	40	7	44
HaF	Hatchery gravelly loam, 37 to 50 percent slopes	20	VIe-5	41	8	44
HaG	Hatchery gravelly loam, 50 to 85 percent slopes	21	VIIe-2	41	11	45
HcF	Hatchery gravelly loam, dissected, 37 to 50 percent slopes	21	VIe-5	41	9	45
HcG	Hatchery gravelly loam, dissected, 50 to 85 percent slopes	20	VIIe-2	41	11	45
HeE	Hatchery-Honeygrove complex, 25 to 37 percent slopes	21	VIe-2	40	7	44
HeF	Hatchery-Honeygrove complex, 37 to 50 percent slopes	21	VIe-5	41	8	44
HgE	Hatchery-Honeygrove complex, dissected, 25 to 37 percent slopes	21	VIe-2	40	9	45
HgF	Hatchery-Honeygrove complex, dissected, 37 to 50 percent slopes	21	VIe-5	41	9	45
Hh	Hebo silty clay loam	21	IVw-2	39	----	----
HlD	Hembre clay loam, 5 to 25 percent slopes	22	VIe-1	40	5	44
HmD	Honeygrove clay, 0 to 25 percent slopes	24	IVe-1	39	1	43
HmE	Honeygrove clay, 25 to 37 percent slopes	24	VIe-1	40	1	43
HmF	Honeygrove clay, 37 to 50 percent slopes	24	VIe-5	41	1	43
HnF	Honeygrove clay, dissected, 25 to 50 percent slopes	24	VIe-1	40	3	43
HoE	Honeygrove clay, dissected uneven, 25 to 37 percent slopes	24	VIe-1	40	4	43
HoF	Honeygrove clay, dissected uneven, 37 to 50 percent slopes	24	VIe-5	41	4	43
HrD	Honeygrove clay, ridge, 5 to 25 percent slopes	24	IVe-1	39	1	43
HrE	Honeygrove clay, ridge, 25 to 37 percent slopes	24	VIe-1	40	1	43
HsD	Honeygrove clay, uneven, 5 to 25 percent slopes	24	IVe-1	39	2	43
HsE	Honeygrove clay, uneven, 25 to 37 percent slopes	22	VIe-1	40	2	43
HsF	Honeygrove clay, uneven, 37 to 50 percent slopes	24	VIe-5	41	4	43
HtD	Honeygrove clay, basalt substratum, 0 to 25 percent slopes	23	IVe-1	39	1	43
HtE	Honeygrove clay, basalt substratum, 25 to 37 percent slopes	24	VIe-1	40	1	43
HuD	Honeygrove clay, basalt substratum, ridge, 0 to 25 percent slopes	24	IVe-1	39	1	43
HvE	Honeygrove clay, basalt substratum, uneven, 10 to 37 percent slopes	25	VIe-1	40	1	43
HwD	Honeygrove clay, heavy variant, 0 to 25 percent slopes	25	IVe-1	39	1	43
HyE	Honeygrove clay, heavy variant, uneven, 25 to 40 percent slopes	25	VIe-1	40	4	43
KcG	Kilchie rocky loam, 50 to 100 percent slopes	25	VIIs-1	42	12	45
KkE	Klickitat loam, 10 to 35 percent slopes	26	VIe-1	40	7	44
KlE	Klickitat gravelly clay loam, 25 to 37 percent slopes	26	VIe-2	40	7	44
KlF	Klickitat gravelly clay loam, 37 to 50 percent slopes	27	VIe-5	41	8	44
KlG	Klickitat gravelly clay loam, 50 to 75 percent slopes	27	VIIe-2	41	11	45
KmE	Klickitat gravelly clay loam, dissected, 25 to 37 percent slopes	27	VIe-2	40	9	45
KmF	Klickitat gravelly clay loam, dissected, 37 to 50 percent slopes	27	VIe-5	41	9	45
KmG	Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes	26	VIIe-2	41	11	45

479-500 O - 73 (Faces Maps) Paster #2

Map symbol	Mapping unit	Page	Capability unit		Forest management group	
			Symbol	Page	Number	Page
KnF	Klickitat gravelly clay loam, ridge, 25 to 45 percent slopes	27	VIe-2	40	7	44
KoF	Klickitat-Blachly complex, 25 to 50 percent slopes	27	VIe-2	40	7	44
KpA	Knappa silt loam, 0 to 3 percent slopes	27	IIc-1	38	----	----
KpB	Knappa silt loam, 3 to 8 percent slopes	28	IIe-1	36	----	----
KsC	Knappa silty clay loam, 8 to 13 percent slopes	28	IIIe-1	38	----	----
La	Landslides-Apt material	28	VIe-1	40	2	43
Ls	Landslides-Slickrock material	28	VIe-1	40	2	43
LtD	Lint silty clay loam, 3 to 25 percent slopes	28	VIe-3	40	5	44
LtE	Lint silty clay loam, 25 to 37 percent slopes	29	VIe-3	40	5	44
Lu	Loamy alluvial land	29	IVw-1	39	----	----
MaD	Marty silty clay loam, 0 to 25 percent slopes	29	VIe-1	40	1	43
MaE	Marty silty clay loam, 25 to 40 percent slopes	30	VIe-1	40	1	43
MrD	Marty silty clay loam, ridge, 10 to 30 percent slopes	30	VIe-1	40	1	43
MuD	Mulkey loam, 5 to 25 percent slopes	30	VIe-4	41	----	----
MuF	Mulkey loam, 25 to 50 percent slopes	30	VIe-4	41	----	----
Ne	Nehalem silt loam	30	IIw-2	37	----	----
NsA	Nestucca silt loam, 0 to 3 percent slopes	31	IIw-2	37	----	----
NsB	Nestucca silt loam, 3 to 8 percent slopes	31	IIIw-2	38	----	----
PhD	Preacher clay loam, 0 to 25 percent slopes	32	VIe-1	40	5	44
PhE	Preacher clay loam, 25 to 37 percent slopes	32	VIe-1	40	5	44
PlF	Preacher clay loam, dissected, 25 to 45 percent slopes	32	VIe-1	40	3	43
PrD	Preacher clay loam, ridge, 0 to 25 percent slopes	32	VIe-1	40	5	44
PrE	Preacher clay loam, ridge, 25 to 37 percent slopes	32	VIe-1	40	5	44
Sa	Sandy alluvial land	32	IVw-1	39	----	----
SgE	Skinner gravelly clay loam, 5 to 37 percent slopes	33	VIe-3	40	7	44
SgF	Skinner gravelly clay loam, 37 to 50 percent slopes	33	VIe-3	40	8	44
SgG	Skinner gravelly clay loam, 50 to 75 percent slopes	33	VIIe-1	41	11	45
SkF	Skinner gravelly clay loam, dissected, 25 to 50 percent slopes	33	VIe-3	40	9	45
SlE	Skinner-Desolation complex, 10 to 37 percent slopes	33	VIe-3	40	7	44
SnF	Skinner-Desolation complex, dissected, 25 to 50 percent slopes	34	VIe-3	40	9	45
SoD	Slickrock loam, 10 to 25 percent slopes	34	VIe-1	40	2	43
SrD	Slickrock loam, dissected, 10 to 25 percent slopes	34	VIe-1	40	4	43
SsD	Slickrock gravelly loam, 0 to 25 percent slopes	34	VIe-1	40	2	43
SsE	Slickrock gravelly loam, 25 to 37 percent slopes	34	VIe-1	40	2	43
SsF	Slickrock gravelly loam, 37 to 50 percent slopes	35	VIe-5	41	4	43
StE	Slickrock gravelly loam, dissected, 25 to 37 percent slopes	35	VIe-1	40	4	43
StF	Slickrock gravelly loam, dissected, 37 to 50 percent slopes	35	VIe-5	41	4	43
SuE	Slickrock gravelly loam, seeped, 10 to 35 percent slopes	35	VIe-1	40	2	43
Tm	Tidal marsh	35	VIIIw-1	42	----	----
TrG	Trask gravelly loam, 50 to 100 percent slopes	35	VIIs-1	42	12	45

479-500 O - 73 (Faces Maps) Paster #1

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Dual
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State or county

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail
- Railroad
- Ferry — FY
- Ford — FORD
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings

- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

BOUNDARIES

- National or state
- County
- Project area
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches — CANAL

Lakes and ponds

- Perennial — water, w
- Intermittent — int

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments

- Bedrock
- Other

Prominent peak

Depressions (Large / Small)

- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Soil sample site — S

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, F, or G shows the slope. Most symbols without a slope letter are those of nearly level soils, but some land types have a considerable range of slope.

SYMBOL	NAME
AaA	Alsea loam, 0 to 3 percent slopes
AaB	Alsea loam, 3 to 8 percent slopes
AcD	Apt clay, 5 to 25 percent slopes
AcE	Apt clay, 25 to 37 percent slopes
AcF	Apt clay, 37 to 50 percent slopes
AdF	Apt clay, dissected, 25 to 45 percent slopes
ArD	Astoria clay loam, dissected, 5 to 25 percent slopes
ArE	Astoria clay loam, dissected, 25 to 37 percent slopes
ArF	Astoria clay loam, dissected, 37 to 50 percent slopes
AsE	Astoria clay loam, dissected uneven, 25 to 37 percent slopes
AsF	Astoria clay loam, dissected uneven, 37 to 50 percent slopes
AtD	Astoria clay loam, ridge, 0 to 25 percent slopes
AuD	Astoria clay loam, uneven, 10 to 25 percent slopes
AuE	Astoria clay loam, uneven, 25 to 37 percent slopes
BaD	Blachly clay loam, 0 to 25 percent slopes
BaE	Blachly clay loam, 25 to 37 percent slopes
BaF	Blachly clay loam, 37 to 50 percent slopes
BbE	Blachly clay loam, dissected, 25 to 40 percent slopes
BcE	Blachly clay loam, dissected uneven, 25 to 37 percent slopes
BcF	Blachly clay loam, dissected uneven, 37 to 50 percent slopes
BdD	Blachly clay loam, ridge, 0 to 25 percent slopes
BeD	Blachly clay loam, uneven, 10 to 25 percent slopes
BeE	Blachly clay loam, uneven, 25 to 37 percent slopes
BeF	Blachly clay loam, uneven, 37 to 50 percent slopes
BfE	Blachly clay loam, basalt substratum, uneven, 25 to 37 percent slopes
BgE	Blachly clay loam, basalt substratum, dissected, 25 to 37 percent slopes
BhD	Blachly clay loam, basalt substratum, ridge, 5 to 25 percent slopes
BhE	Blachly clay loam, basalt substratum, ridge, 25 to 37 percent slopes
BkD	Bohannon loam, ridge, 5 to 25 percent slopes
BlE	Bohannon gravelly loam, 5 to 35 percent slopes
BlF	Bohannon gravelly loam, 35 to 50 percent slopes
BlG	Bohannon gravelly loam, 50 to 75 percent slopes
BmE	Bohannon gravelly loam, dissected, 25 to 37 percent slopes
BmF	Bohannon gravelly loam, dissected, 37 to 50 percent slopes
BmG	Bohannon gravelly loam, dissected, 50 to 90 percent slopes
BnE	Bohannon gravelly loam, ridge, 25 to 37 percent slopes
BnF	Bohannon gravelly loam, ridge, 37 to 50 percent slopes
BoG	Bohannon rocky loam, 75 to 100 percent slopes
BpF	Bohannon gravelly loam, syenite substratum, 5 to 50 percent slopes
BrG	Bohannon gravelly loam, syenite substratum, dissected, 50 to 75 percent slopes
BsE	Bohannon-Slickrock gravelly loams, 25 to 35 percent slopes
BsF	Bohannon-Slickrock gravelly loams, 35 to 50 percent slopes
BsG	Bohannon-Slickrock gravelly loams, 50 to 75 percent slopes
BtE	Bohannon-Slickrock gravelly loams, dissected, 25 to 37 percent slopes
BtF	Bohannon-Slickrock gravelly loams, dissected, 37 to 50 percent slopes
BtG	Bohannon-Slickrock gravelly loams, dissected, 50 to 75 percent slopes
Bu	Brenner silt loam

SYMBOL	NAME
ChA	Chitwood silt loam, 0 to 3 percent slopes
ChC	Chitwood silt loam, 3 to 13 percent slopes
Cs	Clatsop silty clay loam
Cu	Colluvial and Alluvial land
De	Depoe silt loam
DfE	Desolation clay loam, 10 to 35 percent slopes
DgE	Digger gravelly loam, 20 to 37 percent slopes
DgF	Digger gravelly loam, 37 to 50 percent slopes
DgG	Digger gravelly loam, 50 to 75 percent slopes
DlF	Digger gravelly loam, dissected, 37 to 50 percent slopes
DlG	Digger gravelly loam, dissected, 50 to 75 percent slopes
DmE	Digger gravelly loam, ridge, 5 to 37 percent slopes
DpE	Digger-Apt complex, 25 to 37 percent slopes
DpF	Digger-Apt complex, 37 to 60 percent slopes
DsE	Digger-Apt complex, dissected, 25 to 37 percent slopes
DsF	Digger-Apt complex, dissected, 37 to 60 percent slopes
Du	Dune land
FdE	Fendall gravelly clay loam, 25 to 37 percent slopes
FdF	Fendall gravelly clay loam, 37 to 50 percent slopes
FdG	Fendall gravelly clay loam, 50 to 75 percent slopes
FeD	Ferrelo loam, 5 to 30 percent slopes
HaE	Hatchery gravelly loam, 25 to 37 percent slopes
HaF	Hatchery gravelly loam, 37 to 50 percent slopes
HaG	Hatchery gravelly loam, 50 to 85 percent slopes
HcF	Hatchery gravelly loam, dissected, 37 to 50 percent slopes
HcG	Hatchery gravelly loam, dissected, 50 to 85 percent slopes
HeE	Hatchery-Honeygrove complex, 25 to 37 percent slopes
HeF	Hatchery-Honeygrove complex, 37 to 50 percent slopes
HgE	Hatchery-Honeygrove complex, dissected, 25 to 37 percent slopes
HgF	Hatchery-Honeygrove complex, dissected, 37 to 50 percent slopes
Hh	Hebo silty clay loam
HlD	Hembre clay loam, 5 to 25 percent slopes
HmD	Honeygrove clay, 0 to 25 percent slopes
HmE	Honeygrove clay, 25 to 37 percent slopes
HmF	Honeygrove clay, 37 to 50 percent slopes
HnF	Honeygrove clay, dissected, 25 to 50 percent slopes
HoE	Honeygrove clay, dissected uneven, 25 to 37 percent slopes
HoF	Honeygrove clay, dissected uneven, 37 to 50 percent slopes
HrD	Honeygrove clay, ridge, 5 to 25 percent slopes
HrE	Honeygrove clay, ridge, 25 to 37 percent slopes
HsD	Honeygrove clay, uneven, 5 to 25 percent slopes
HsE	Honeygrove clay, uneven, 25 to 37 percent slopes
HsF	Honeygrove clay, uneven, 37 to 50 percent slopes
HtD	Honeygrove clay, basalt substratum, 0 to 25 percent slopes
HtE	Honeygrove clay, basalt substratum, 25 to 37 percent slopes
HuD	Honeygrove clay, basalt substratum, ridge, 0 to 25 percent slopes
HvE	Honeygrove clay, basalt substratum, uneven, 10 to 37 percent slopes
HwD	Honeygrove clay, heavy variant, 0 to 25 percent slopes
HyE	Honeygrove clay, heavy variant, uneven, 25 to 40 percent slopes

SYMBOL	NAME
KcG	Kilchis rocky loam, 50 to 100 percent slopes
KkE	Klickitat loam, 10 to 35 percent slopes
KlE	Klickitat gravelly clay loam, 25 to 37 percent slopes
KlF	Klickitat gravelly clay loam, 37 to 50 percent slopes
KlG	Klickitat gravelly clay loam, 50 to 75 percent slopes
KmE	Klickitat gravelly clay loam, dissected, 25 to 37 percent slopes
KmF	Klickitat gravelly clay loam, dissected, 37 to 50 percent slopes
KmG	Klickitat gravelly clay loam, dissected, 50 to 85 percent slopes
KnF	Klickitat gravelly clay loam, ridge, 25 to 45 percent slopes
KoF	Klickitat-Blachly complex, 25 to 50 percent slopes
KpA	Knappa silt loam, 0 to 3 percent slopes
KpB	Knappa silt loam, 3 to 8 percent slopes
KsC	Knappa silty clay loam, 8 to 13 percent slopes
La	Landslides-Apt material
Ls	Landslides-Slickrock material
LtD	Lint silty clay loam, 3 to 25 percent slopes
LtE	Lint silty clay loam, 25 to 37 percent slopes
Lu	Loamy alluvial land
MaD	Marty silty clay loam, 0 to 25 percent slopes
MaE	Marty silty clay loam, 25 to 40 percent slopes
MrD	Marty silty clay loam, ridge, 10 to 30 percent slopes
MuD	Mulkey loam, 5 to 25 percent slopes
MuF	Mulkey loam, 25 to 50 percent slopes
Ne	Nehalem silt loam
NsA	Nestucca silt loam, 0 to 3 percent slopes
NsB	Nestucca silt loam, 3 to 8 percent slopes
PhD	Preacher clay loam, 0 to 25 percent slopes
PhE	Preacher clay loam, 25 to 37 percent slopes
PlF	Preacher clay loam, dissected, 25 to 45 percent slopes
PrD	Preacher clay loam, ridge, 0 to 25 percent slopes
PrE	Preacher clay loam, ridge, 25 to 37 percent slopes
Sa	Sandy alluvial land
SgE	Skinner gravelly clay loam, 5 to 37 percent slopes
SgF	Skinner gravelly clay loam, 37 to 50 percent slopes
SgG	Skinner gravelly clay loam, 50 to 75 percent slopes
SkF	Skinner gravelly clay loam, dissected, 25 to 50 percent slopes
SlE	Skinner-Desolation complex, 10 to 37 percent slopes
SnF	Skinner-Desolation complex, dissected, 25 to 50 percent slopes
SoD	Slickrock loam, 10 to 25 percent slopes
SrD	Slickrock loam, dissected, 10 to 25 percent slopes
SsD	Slickrock gravelly loam, 0 to 25 percent slopes
SsE	Slickrock gravelly loam, 25 to 37 percent slopes
SsF	Slickrock gravelly loam, 37 to 50 percent slopes
StE	Slickrock gravelly loam, dissected, 25 to 37 percent slopes
StF	Slickrock gravelly loam, dissected, 37 to 50 percent slopes
SuE	Slickrock gravelly loam, seeped, 10 to 35 percent slopes
Tm	Tidal marsh
TrG	Trask gravelly loam, 50 to 100 percent slopes